S. Hrg. 99-330

# WATER SUPPLY ISSUES IN THE MIDDLE ATLANTIC STATES

---

# HEARINGS

BEFORE THE

SUBCOMMITTEE ON WATER AND POWER

OF THE

COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

NINETY-NINTH CONGRESS

FIRST SESSION

ON THE

WATER SUPPLY ISSUES IN THE MIDDLE ATLANTIC STATES

WASHINGTON, DC, JULY 22, 1985
HACKENSACK, NJ, AUGUST 6, 1985
CHERRY HILL, NJ, AUGUST 7, 1985

Printed for the use of the
Committee on Energy and Natural Resources

U.S. GOVERNMENT PRINTING OFFICE
54-629 O WASHINGTON : 1986

S311-18

## COMMITTEE ON ENERGY AND NATURAL RESOURCES

JAMES A. McCLURE, Idaho, *Chairman*

MARK O. HATFIELD, Oregon
LOWELL P. WEICKER, Jr., Connecticut
PETE V. DOMENICI, New Mexico
MALCOLM WALLOP, Wyoming
JOHN W. WARNER, Virginia
FRANK H. MURKOWSKI, Alaska
DON NICKLES, Oklahoma
CHIC HECHT, Nevada
DANIEL J. EVANS, Washington

J. BENNETT JOHNSTON, Louisiana
DALE BUMPERS, Arkansas
WENDELL H. FORD, Kentucky
HOWARD M. METZENBAUM, Ohio
JOHN MELCHER, Montana
BILL BRADLEY, New Jersey
JEFF BINGAMAN, New Mexico
JOHN D. ROCKEFELLER IV, West Virginia

Frank M. Cushing, *Staff Director*
Gary G. Ellsworth, *Chief Counsel*
D. Michael Harvey, *Chief Counsel for the Minority*

---

### Subcommittee on Water and Power

FRANK H. MURKOWSKI, Alaska, *Chairman*

MARK O. HATFIELD, Oregon
DANIEL J. EVANS, Washington
DON NICKLES, Oklahoma
LOWELL P. WEICKER, Jr., Connecticut

BILL BRADLEY, New Jersey
WENDELL H. FORD, Kentucky
HOWARD M. METZENBAUM, Ohio
JOHN MELCHER, Montana

James A. McClure and J. Bennett Johnston are Ex Officio Members of the Subcommittee

Russell R. Brown, *Professional Staff Member*

# CONTENTS

Hearings: Page
July 22, 1985, Washington, DC ..... 1
August 6, 1985, Hackensack, NJ ..... 293
August 7, 1985, Cherry Hill, NJ ..... 359

MONDAY, JULY 22, 1985

STATEMENTS

Atwater, Richard W., Special Assistant to the Commissioner of Reclamation, Department of the Interior ..... 31
Bradley, Hon. Bill, a U.S. Senator from the State of New Jersey ..... 2
Gaston, John W., director, Division of Water Resources, New Jersey Department of Environmental Protection ..... 63
Kavanaugh, Brig. Gen. Paul F., Division Commander, North Atlantic Division, U.S. Army Corps of Engineers, accompanied by Robert Callegari, chief, Passaic River Basin Study Group, New York District; and Salvadore Bucolo, Assistant Chief, Planning and Engineering Division, U.S. Army Corps of Engineers, Philadelphia District ..... 43
Murkowski, Hon. Frank H., a U.S. Senator from the State of Alaska ..... 1
Peck, Dr. Dallas L., Director, U.S. Geological Survey Department of the Interior, accompanied by Philip Cohen, Chief Hydrologist: Bill Schaefer, Delaware River Master; and Don Vaupel, chief, New Jersey Water Resources Division ..... 4

TUESDAY, AUGUST 6, 1985

STATEMENTS

Allee, Dr. David J., Cornell University ..... 309
Bradley, Hon. Bill, a U.S. Senator from the State of New Jersey ..... 293
Buzzi, Dr. John L., director and founding member, New Jersey Alliance for Action ..... 325
Gerber, Robert A., president and chief executive officer, United Water Resources, Inc ..... 349
Marsh, Langdon, executive deputy commissioner, New York State Department of Environmental Conservation ..... 295
McGough, Joseph T., Jr., commissioner, New York City Department of Environmental Protection ..... 300
Ricci, Rocco D., executive director, New Jersey Water Supply Authority ..... 330
Tompkins, J. Richard, president, Middlesex Water Co ..... 341

WEDNESDAY, AUGUST 7, 1985

STATEMENTS

Bradley, Hon. Bill, a U.S. Senator from the State of New Jersey ..... 359
Cobb, William R., system company president, American Water Works Service Co ..... 488
Coldren, Fred, city manager, city of Cape May, NJ, accompanied by David Carrick, superintendent, Water and Sewer Utilities, city of Cape May, NJ ..... 489
Furey, Peter J., secretary/administrator, New Jersey Farm Bureau ..... 483
Haskin, Peggy, member, Natural Resources Committee, League of Women Voters of New Jersey ..... 442
Noble, Mary Ellen, Watershed Association of the Delaware River ..... 467

Page
Owen, Robert I., conservationist, West Long Branch, NJ ........ 485
Simpkins, Robert N., legislative chairman, State of Grange of New Jersey ........ 481
Stewart, Bruce E., executive director Water Resources Association of the Delaware River Basin ........ 384
Weston, R. Timothy, commissioner, Delaware River Basin Commission ........ 361

## APPENDIX

Additional material submitted for the record ........ 501

# WATER SUPPLY ISSUES IN THE MIDDLE ATLANTIC STATES

---

MONDAY, JULY 22, 1985

U.S. SENATE,
SUBCOMMITTEE ON WATER AND POWER,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
*Washington, DC.*

The subcommittee met, pursuant to notice, at 10:35 a.m. in room SD-366, Dirksen Senate Office Building, Hon. Frank H. Murkowski presiding.

Present: Senators Murkowski and Bradley.

Also present: Russell R. Brown, professional staff member; and William B. Conway, counsel for the minority.

## OPENING STATEMENT OF HON. FRANK H. MURKOWSKI, A U.S. SENATOR FROM THE STATE OF ALASKA

Senator MURKOWSKI. The hearing will come to order.

The hearing this morning before the Subcommittee on Water and Power, Committee on Energy and Natural Resources, is to take testimony from Federal and State agencies regarding the water supply issues in the mid-Atlantic States.

I might observe that this hearing was scheduled before we were aware that the Senate would not be in session today, so Senator Bradley and myself are making an extraordinary effort to keep our commitments. But you might have a hard time finding other Senators around the halls today.

This year, portions of the States of New Jersey, New York, Pennsylvania, and Delaware have experienced drought conditions. As a matter of fact, 46 of the 48 contiguous States are experiencing a short-water year. But, drought conditions are not the subject of the hearing. Rather, the drought has served to focus attention on water supply issues in general.

The nature, the immediacy, and the seriousness of the water supply problems faced by the United States vary greatly from region to region. Water supply problems are not a new issue. In fact, concern for the Nation's water resource has been repeatedly expressed.

We need only to look back at the report issued by the Senate Select Committee on National Water Resources during the 87th Congress to find recommendations that are as timely today as they were then. There is certainly no new water crisis. The problems of water have always been with us and undoubtedly always will be.

What does recur is the need to educate and direct. Certainly the hearing will serve to educate the members and the staff, and may serve as the initial step toward further congressional direction of the Nation's water resource efforts.

It may be that a series of hearings will be held over an extended period of time on the Nation's water shortage. There have been provisions proposed by various groups, such as Parsons Engineering and others, for rather revolutionary ideas of putting water down from various sources in North America and Canada, and bringing it into the United States, and the committee will pursue those proposals over a period of time.

I would like to express my appreciation to Senator Bradley from New Jersey for his help and direction in focusing the attention of the subcommittee on the water supply issues of the mid-Atlantic region and his able assistance in formulating this hearing.

Senator Bradley, I believe you have a statement.

## STATEMENT OF HON. BILL BRADLEY, A U.S. SENATOR FROM THE STATE OF NEW JERSEY

Senator **Bradley**. Thank you very much, Mr. Chairman, for agreeing to schedule these hearings. I appreciate it and our whole region appreciates it. I hope in the hearing we'll learn more about the water issues that are of importance to the mid-Atlantic area.

Concerning water supply matters, our Nation has been divided, historically, into two regions. Dry conditions prevail in our Western States where average rainfall is a mere 15 inches per year. As a result, these States have been forced to deal with the difficulties associated with consistently scarce water resources.

This has contrasted with the 45 inches of annual rainfall enjoyed in the Eastern States. In fact the abundance of this resource has been an integral part in the development of the region. The result has been a very different water management policy and even very different water supply psychologies.

However, a severe drought during the 1960's, as well as the past 5 years of on-again, off-again drought warnings, have increased public discussions of water supply issues in the Eastern United States. We, who live in this region, cannot take for granted plentiful water supplies. We see an increasing amount of attention given to our Nation's emerging water supply crisis.

But, we must distinguish between the availabilty of useful water with the supply of the natural resource itself. Until that is done, the public is likely to believe that our water supplies are diminishing.

The fact is that we as a nation consume only 7 percent of our renewable water supply. Under those circumstances, I question the use of the terminology "water supply crisis." How can we reconcile the abundance of the natural resource with the obvious scarcity of available water?

It's my belief that we are suffering the results of insufficient long-range planning and management of water supply. Therefore, in order to best meet our future needs, it is important for us to examine the issues more carefully, determine where the problems are, and develop some long-range strategies.

We'll begin by considering water issues in the Middle Atlantic region. Our hearing today will have a dual purpose. During the first half, I look forward to hearing perspectives of the Federal agencies on water supply issues and what resources they can make available to the States. The U.S. Geological Survey is the Department of the Interior's principal water information agency—collecting, evaluating and disseminating data on all aspects of the Nation's water resources.

While, the USGS has many years of experience in water information management, both the Bureau of Reclamation and the Army Corps of Engineers have equally impressive track records of water storage and transport. I hope we can learn from the Bureau's experience in the drier western part of the United States.

The Army Corps has played a leading role in studying water supply issues in the Eastern part of the country. Two outstanding assessments conducted by the corps which I'm sure we are going to hear more about are the 1977 Northeastern Water Supply Study, the NEWS study, and the New York Metropolitan Area Water Supply Study of 1984, the so-called NYMS study. I thank each of you for agreeing to be with us today to share your expertise.

Following the testimony from Federal agencies, I look forward to hearing from the office of the Governor of New Jersey and their general overview of water issues confronting the State.

So, in sum, our focus will be, first, Federal resources; and, second, States' perspectives. Our efforts will by no means end today. We'll continue delving into these issues by conducting regional hearings in August and, at that time, we'll focus our attention on more local concerns.

Let me emphasize that we are here to learn. There are many questions which I wish to explore. Some examples are: Who are the largest consumers of water in the region? Is the water used primarily for irrigation, domestic or industrial purposes? What are the present sources of available water? What are the hazards that threaten our supply? What are the projections of the future supply versus demand?

If supplies are predicted to be overly strained, should our priority be conservation programs or the development of new sources? Who must bear the costs of such new development? Who will decide on appropriate conservation measures, given vast numbers of competing areas? What's the appropriate role for the Federal Government in water management?

Mr. Chairman, I look forward to the help our witnesses will give us in seeking answers to these questions, and I again thank you for being willing to conduct these hearings.

Senator Murkowski. Thank you, Senator Bradley.

Our witness list this morning consists of Dr. Dallas L. Peck, Director of the U.S. Geological Survey, Reston, VA, who is accompanied by Mr. Philip Cohen, Chief Hydrologist, U.S. Geological Survey; Mr. Richard Atwater, Special Assistant to the Commissioner of Reclamation, Department of the Interior; Brig. Gen. Paul F. Kavanaugh, Commander—Engineer Division, North Atlantic, U.S. Army Corps of Engineers, New York; and Mr. John Gaston, Director, Division of Water Resources, Department of Environmental Protection, State of New Jersey, Trenton, NJ.

That constitutes the witnesses. And, Senator Bradley, I would appreciate it if you would be kind enough to conduct the balance of the hearing today.

Senator BRADLEY. Thank you, Mr. Chairman, I would be pleased to.

Senator MURKOWSKI. Gentlemen.

Senator BRADLEY [presiding]. Dr. Peck, you may begin.

## STATEMENT OF DR. DALLAS L. PECK, DIRECTOR, U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR, ACCOMPANIED BY PHILIP COHEN, CHIEF HYDROLOGIST; BILL SCHAEFER, DELAWARE RIVER MASTER; AND DON VAUPEL, CHIEF, NEW JERSEY WATER RESOURCES DIVISION

Dr. PECK. Thank you, Senator Bradley.

We welcome the opportunity to discuss the water situation in the mid-Atlantic States today. The Geological Survey, through the activities of its Water Resources Division, conducts a wide variety of multidisciplinary water-resources investigations throughout the United States. These investigations directly respond to the diverse questions and issues facing Federal, State, and local agencies that are responsible for managing water resources and providing quality water supply.

The Survey's water resources activities, which total somewhat over $200 million a year, are funded from three sources: direct congressional appropriations to the Survey; funds from other Federal agencies, such as the Corps of Engineers and the Bureau of Reclamation; and State and local agency funds which are matched by specific congressional appropriations.

This cooperative program, which was established in 1895, is the largest component of our water-resources activities. We have partnership with more than 900 agencies who work with survey scientists in the 43 district offices with projects in every State of the Nation. The total matching program amounts to $102 million this year, the largest part of our water program.

My testimony today addresses the water problems in the mid-Atlantic States which are common to many other States in the country—the problems illustrated by the Delaware River Basin drought and also water issues in New Jersey. I'll touch briefly on the types of assistance provided to water managers by the Geological Survey.

I am accompanied by Mr. Phil Cohen, the Chief Hydrologist and head of our Water Resources Division, who will point out salient aspects on the charts; also, by Mr. Bill Schaefer of the Survey, who is the Delaware River Master; and Mr. Don Vaupel, who is Chief of the New Jersey Office of our Water Resources Division.

At the table there should be a folder, Senator, that includes copies of our posters and also copies of the relevant sections of our National Water Summary for 1983 and for 1984 for the States of the mid-Atlantic.

The first poster shows the mid-Atlantic region. The region is a very important economic center, supporting a large urban population, with annual precipitation of 40 to 48 inches and a runoff of 20 to 30 inches. It includes four great river systems—the Connecticut River with an average daily flow of 10,000 million gallons, the

Hudson with 12,000, the Delaware with 8,000, and the Susquehanna with 27,000. The individual average daily flows of these rivers exceed New York City's water demands by 5 to 20 times. New York City's average annual water demand was 1.4 billion gallons a day in 1984.

The water supply in this area varies with the geology and topography. The Fall Line, which Mr. Cohen is pointing out, is the inner boundary of the Coastal Plain and it separates consolidated rocks to the northeast of crystalline and Triassic sedimentary rocks, which yield relatively small amounts of ground water.

On the other side of the Fall Line are the unconsolidated sands and gravels of the Coastal Plain, which commonly provide an abundance of good quality ground water. Large metropolitan areas along the Fall Line—New York City, urban northeastern New Jersey, Philadelphia, and Wilmington—with some of the highest concentrations of people in the country, depend primarily on surface water supply.

As population has grown, water use and competition for existing high-quality water supplies have also increased.

The next board is a sketch map of the Delaware River Basin. Early in this century, New York City looked to the Catskills and the adjacent upper Delaware River Basin for additional water supply. That effort was resisted by Pennsylvania, New Jersey, and later the State of Delaware.

In 1954, a Supreme Court decree provided for New York City to divert an average of 800 million gallons a day from the Delaware River Basin, but with the proviso that compensating releases from the reservoir system were to maintain a flow of 1.1 million gallons a day at Montague, NJ. That minimum flow was required to prevent saline water in the Delaware estuary from moving upstream to the Toursdale Water Treatment Plant intake at Philadelphia.

During drought conditions, Montague flow objectives are increased or decreased, depending on the location of the Salt front which is monitored very closely. The court decree specified that a USGS official serve as Delaware River Master. And the current River Master, Bill Schaefer, is with us today.

The next board shows the major water features of the Northeast drought area. The New York City water supply consists of three major components: the Delaware system, with three reservoirs and tunnels to Rondout Reservoir and thence into the Delaware Aqueduct into the city, provides about half of New York City's water demand; the Catskill system, which has two reservoirs, goes via the Catskill Aqueduct to the city; and the Croton system which was established in 1882 and is the oldest of the systems.

Maybe Mr. Cohen would point out the Chelsey Pumping Station which we'll touch on a little later today. All three of these systems are gravity systems.

The New York City water demand in 1984 was 1.4 billion gallons per day. Currently, the city is striving to reduce the demand to 1.1 billion gallons per day.

On the next board, we see the pattern of filling of those reservoirs. This shows the reservoir contents as a percentage of capacity. The total capacity is about 275 billion gallons.

In November 1984, the Delaware Reservoir System content was about 40 percent of capacity. In January 1985, the contents were low enough to require a reduction of diversion to New York City to 680 million gallons per day; and on February 6, the contents continued to fall, requiring a reduction of diversions to 560 million gallons per day.

On May 13, the Delaware River Basin Commission declared a drought emergency condition and banned nonessential use of water in the Basin. On July 10, New York City began pumping 60 to 70 million gallons per day from the Hudson River at the Chelsey Treatment Plant.

The maximum capacity of that plant is about 100 million gallons per day. On July 19, the storage content of the Delaware system totaled 153 billion gallons or 56 percent of capacity. At the present diversion rate and the projected flow releases at Montague, the existing reservoir supply could be adequate for about 6 months without any additional precipitation.

Turning to New Jersey water issues—next board. New Jersey water issues illustrate many of the water supply problems present in other Eastern States. This board illustrates flooding, which is a problem during periods of excessive precipitation, particularly in northern New Jersey, because of the character of the geology, shales and crystalline rocks, and the high-population density.

The runoff has accelerated from impervious areas in recent years, impervious areas such as parking lots and buildings and highways. And that accelerated runoff has caused substantial damage to property.

Recent USGS studies are defining methods for predicting the frequency and magnitude of floods, and also delineating the areas inundated.

The next poster shows northern New Jersey. There water utilities are largely dependent upon surface water. It illustrates the problems with water supply. In that area, 12 of the 25 largest water suppliers in New Jersey can meet the existing demands only when precipitation is greater than average.

Currently the Survey, in cooperation with the State, is helping to define areas where ground water is available in valley aquifers to temporarily supplement surface-water supplies during droughts.

Declining ground water levels is a major issue in the southern part of the State, where most water suppliers rely on extensive aquifers in unconsolidated Coastal Plain sediments. There, large water-level declines have occurred at major pumping centers.

The board shows, in the yellow areas, a decline to more than 60 feet below sea level. The largest declines included Lakewood, 250 feet below sea level; Atlantic City, 70 feet; Camden, 100 feet. Because of these declines, there is salt water intrusion into the water supply aquifers, particularly near Atlantic City, near Lakewood, and also near Camden.

Recently, the Survey has constructed simulation models of ground water flow systems to predict the effects of pumping on ground water levels at State-designated critical ground water areas. The State plans to use these models to adjust existing ground water allocations to mitigate the adverse effects of pumping, such as saline water intrusion.

The next board illustrates another problem, that of ground water contamination. We call it the measle board out at the Survey. The water resources base of New Jersey is affected by numerous areas of contamination. The board shows 97 hazardous waste sites that are on EPA's national priorities list, the Superfund list. That's about 12 percent of the Superfund sites.

The State of New Jersey has estimated that there may be as many as 2,000 sites that potentially could have contaminated surface and ground water. These known areas contain excessive amounts of organic compounds, dissolved metals, sewage, and other industrial waste.

More than 700 wells have been closed already because of contamination. The Survey has begun to relate land use to ground water quality and to define the occurrence and movement of contaminants to help the local water managers.

Each of the issues that we've gone over raises complex hydrologic questions. In New Jersey, the Geological Survey has been systematically collecting and analyzing hydrologic information for use by planners and managers since the early 1920's. In 1985, the total programs in New Jersey amounted to $6 million—60 percent funded by State and local agencies.

This next board shows the cooperative agencies in the State. They include the New Jersey Department of Environmental Protection, our largest cooperator in the State, and such entities as Somerset County, and Logan Township. In Somerset County, for example, the USGS is quantifying the relationship between rainfall and runoff to determine the magnitude and frequency of flooding and the effects of changing land use on flooding events.

In Logan Township, down near Camden, the Survey is studying the occurrence, distribution, and movement of chemical constituents within the ground water system and defining the importance of chemical processes.

In summary, the Survey has provided State and local water planners and managers a variety of technical assistance, which includes collecting and providing data on streamflow, quality of surface water, the characteristics of aquifers, the quality of ground water, and water use. And we're building hydrologic models to simulate the behavior of ground water and surface water and also inventorying water use.

Mr. Chairman, the Geological Survey stands ready to assist the water managers of State and local agencies throughout the country to obtain and interpret water information needed to make the best use of available water resources, and to keep the public informed of the value and importance of water to society. Our scientists and technicians in each State are available to assist people in acquiring and utilizing water information.

That concludes my testimony.

I and my colleagues shall be happy to answer any questions.

[The prepared statement of Dr. Peck follows:]

# AN OVERVIEW OF WATER-SUPPLY ISSUES OF THE MID-ATLANTIC STATES

TESTIMONY OF DALLAS L. PECK, DIRECTOR, U.S. GEOLOGICAL SURVEY, BEFORE THE
SUBCOMMITTEE ON WATER AND POWER, COMMITTEE ON ENERGY AND NATURAL RESOURCES,
UNITED STATES SENATE

July 22, 1985

Mr. Chairman, thank you for this opportunity to discuss the water situation in the Mid-Atlantic States. The Geological Survey, through the activities of its Water Resources Division, conducts a wide variety of multidisciplinary water-resources investigations throughout the United States. These investigations directly respond to the diverse questions and issues facing Federal, State, and local agencies in their efforts to provide and protect a "quality" water supply for the Nation. The water-resources activities of the Survey are funded by three sources:

1. Funds appropriated by the Congress to the Geological Survey;
2. Funds provided by other Federal agencies;
3. Funds from State and local cooperating agencies that are matched with specific congressionally appropriated funds to the extent that such matching money is available.

The Survey's Federal-State cooperative water-resources program includes the participation of over 900 State and local agencies who work closely with Survey scientists and technicians located in 43 District Offices nationwide. The program includes hydrologic research and modeling, interpretive studies, data collection and analysis, and the coordination of Federal water data-related activities and addresses the information needs of most of the water issues facing the Nation.

My testimony this morning addresses water problems in the Mid-Atlantic States as illustrated by the current drought situation in the Delaware River basin and by the range of water issues facing the State of New Jersey. These issues reflect the nature and complexity of water-supply problems facing many parts of the United States today; they are not unique to the northeast. I will conclude with a brief description of the types of assistance provided water managers by the U.S. Geological Survey.

Mid-Atlantic Region

The States of New York, Pennsylvania, New Jersey, and Delaware are fortunate in that on the average they have an abundant water supply. Annual precipitation averages 40 to 48 inches of which 20 to 30 inches runs off in streams and rivers. About two percent of this water is consumed by use. To the northwest of the Fall Line, the inland boundary of the Coastal Plain, consolidated rocks generally do not yield large amounts of ground water. Water suppliers in this area generally depend upon surface water. To the southeast of the Fall Line, unconsolidated sands and gravels of the Coastal Plain commonly provide an abundance of ground water. Wells are comparatively inexpensive, and generally yield good quality water for communities in this area. Large metropolitan areas, such as New York City, northeastern New Jersey, Philadelphia, and Wilmington with some of the highest population densities in the United States, lie along the Fall Line. As population has grown, water use and competition for existing water supplies have also increased.

Despite plentiful water resources, increasing demands have outstripped the ability of existing water-supply systems to provide a reliable supply in times of drought. For some communities it is barely possible to meet existing demands during periods of normal precipitation. A modest period of deficient precipitation can trigger serious water-supply problems.

Delaware River Basin

Early in this century the City of New York developed plans to use water from the upper Delaware River basin to provide an adequate and safe water supply for the rapidly growing city. These plans to export water from the basin were resisted by the other basin States. The United States Supreme Court decree of 1954 provided that the city could divert an average of 800 million gallons per day from the Delaware River. Compensating releases from city reservoirs in the upper basin were specified to maintain a flow of 1,100 million gallons per day at the U.S. Geological Survey gaging station on the Delaware River at Montague, New Jersey. Diversions by New Jersey were limited to an average of 100 million gallons per day from the Delaware River basin. A Delaware River Master was established to administer the terms of the decree. The Court specified that an official of the U.S. Geological Survey should serve as River Master.

The New York City water-supply system consists of three major components: the Delaware, Catskill, and Croton systems. The Delaware system is composed of the Neversink, Pepacton, and Cannonsville Reservoirs which feed water through tunnels into a collecting reservoir, Rondout, in the Hudson River drainage. From Rondout the water flows by gravity into the Delaware Aqueduct for a trip of 90 miles to the city. The Catskill system is composed of the Schoharie and Ashokan Reservoirs which are connected by a tunnel. Water is channeled into the Catskill Aqueduct and thence into the city's distribution system. The Croton system, the smallest and the oldest of the systems, was originally put in operation in 1842. Croton water is conveyed to the city through two aqueducts.

Water demands of New York City in 1984 averaged 1.4 billion gallons per day. The Delaware System meets about 45 percent of this demand.

At the beginning of this water year (October 1, 1984) storage in the Delaware system was at about 63 percent of capacity and declining rapidly. In January 1985, reservoir contents declined below the drought warning level, and in accord with procedures agreed upon earlier by the basin States and New York City, the River Master's office directed that New York City reduce its diversions to 680 million gallons per day effective January 23. On February 6, combined reservoir contents dropped into the lower half of the drought warning zone, so the allowable diversions were reduced to 560 million gallons per day. On May 13, 1985, a drought emergency was declared at a special meeting of the Delaware River Basin Commission which banned non-essential uses of water in parts of New York, New Jersey, Pennsylvania, and Delaware.

Recent rainfall in May and June has alleviated the situation in the lower basin, but upper basin reservoir contents are still dangerously low for this time of year. On June 30, reservoir contents of the Delaware system were 58 percent of capacity and, on July 10, the City took steps to utilize water from the Hudson River.

## New Jersey Water Issues

New Jersey's water issues illustrate many of the water-supply problems present in most of the States in the eastern part of the Nation. In the northern part of the State, because of the character of the geology and the high population density, river flooding is a problem during periods of excess precipitation. Being a coastal State, the New Jersey shoreline is also vulnerable to tidal flooding during severe storms and hurricanes.

Lacking high yielding aquifers in the igneous and sedimentary rocks of northern New Jersey, water utilities are dependent primarily on surface-water supplies. In fact, 12 of the 25 largest water suppliers in the northern part of the State can meet existing water demands only when precipitation is greater than average.

Major issues in the southern part of the State, where most water suppliers rely on extensive aquifers in unconsolidated Coastal Plain sediments, include large water-level declines at major pumping centers, such as Camden, salt-water intrusion near coastal areas, and the ever-increasing occurrence and potential for ground-water contamination from various land uses and from the disposal of hazardous wastes.

Each of these issues raises complex questions about the rate of movement of water, the source and fate of pollutants, and the impact and effectiveness of management actions taken to reduce and eliminate the adverse effects of water use. The State's choices and decisions depend upon the availability of a variety of water information, much of which has been provided through long-term programs of the U.S. Geological Survey.

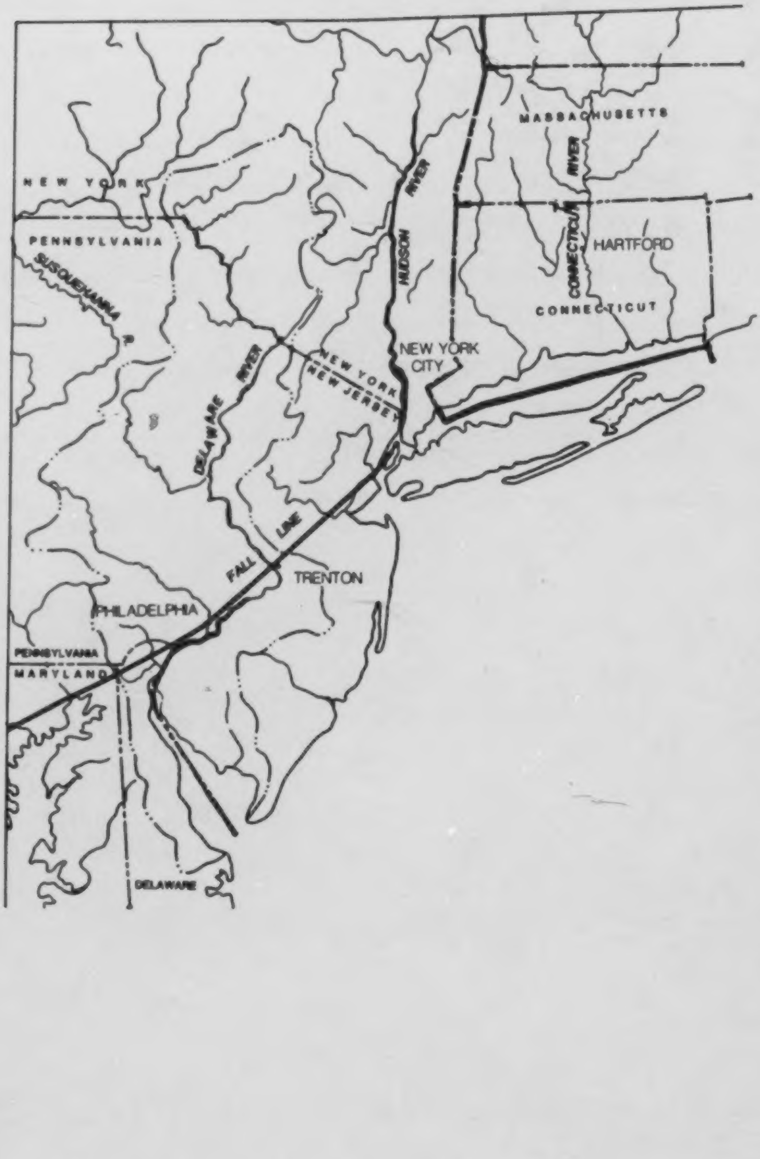
## U.S. Geological Survey Assistance

In New Jersey, the Geological Survey has been systematically collecting and analyzing hydrologic information for use by planners and managers since the early 1920's. In 1985, the total Survey water programs in New Jersey amounted to $6 million of which nearly 60 percent is funded by State and local agencies, such as the New Jersey Department of Environmental Protection, Somerset County, and Logan Township. The results of water-resources investigations provide water planners and managers with the technical tools and information needed to answer questions about the distribution of water resources and the behavior of the hydrologic system under stress. The Geological Survey collects and provides data on streamflow, quality of surface water, the characteristics of aquifers, the quality of ground water, and water use. The Survey conducts resource assessments to evaluate the water resources of an area. Such studies might define the hydrogeologic framework of an area, characterize the natural water quality, and use computer models to simulate the behavior of surface water and ground water under different patterns of withdrawals.

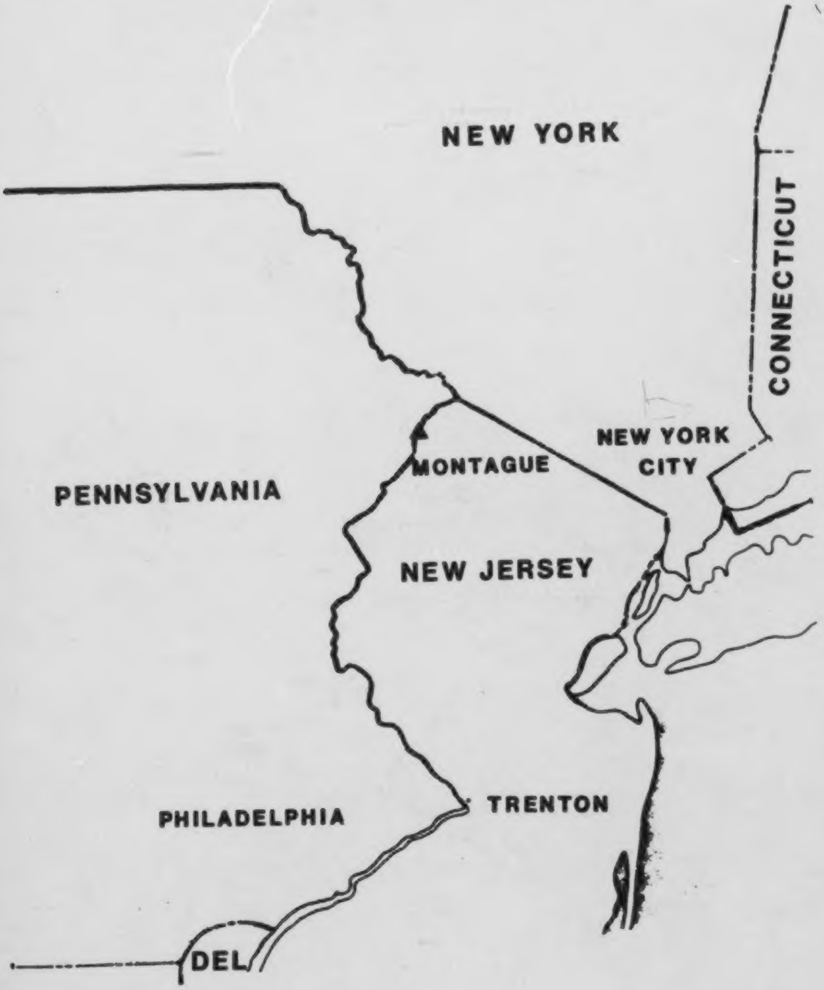
Mr. Chairman, the Geological Survey stands ready to assist State and local water managers in obtaining and interpreting water information needed to make the best use of available resources and to keep the public informed of the value and importance of water to society. Our scientists and technicians in each State are there to assist people in acquiring and effectively utilizing water information.

That concludes my testimony. I will be pleased to answer any questions that you and members of the Subcommittee may have.

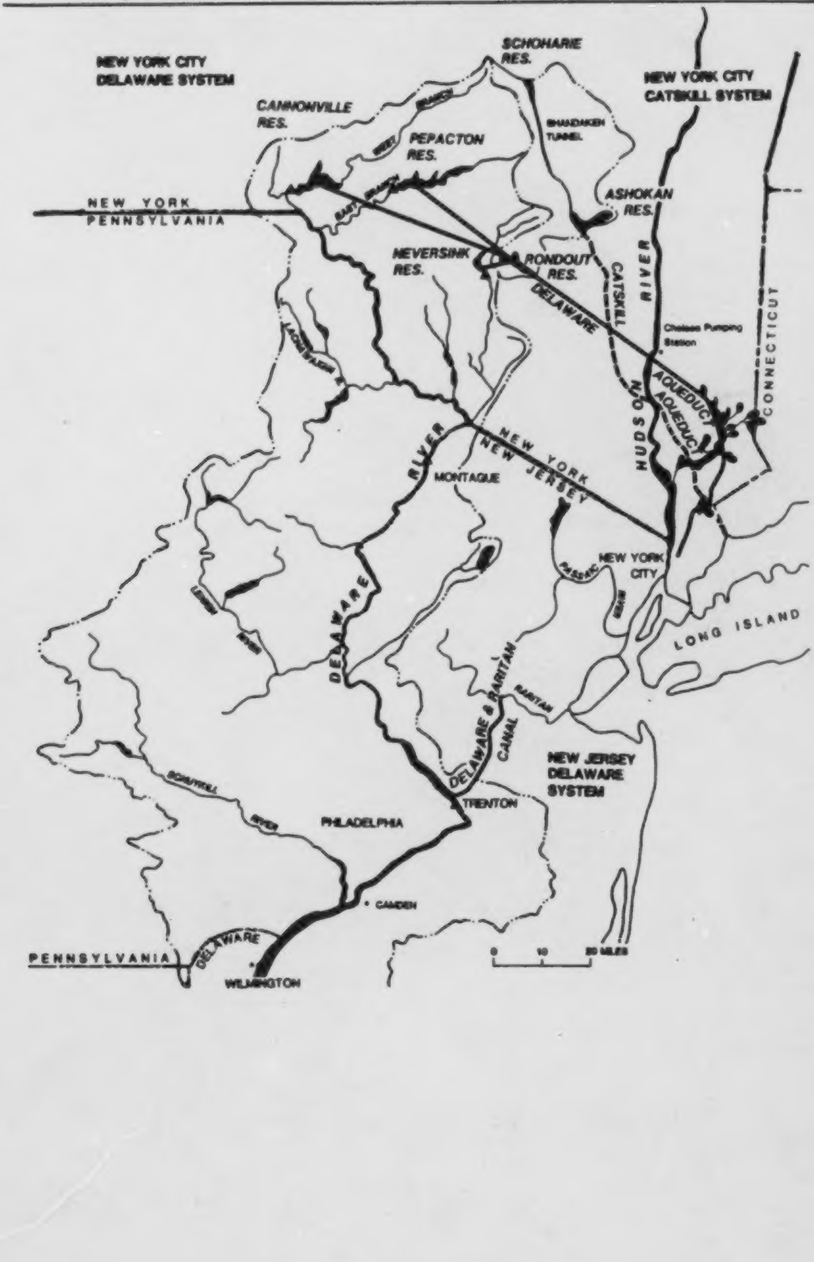
## Mid-Atlantic States

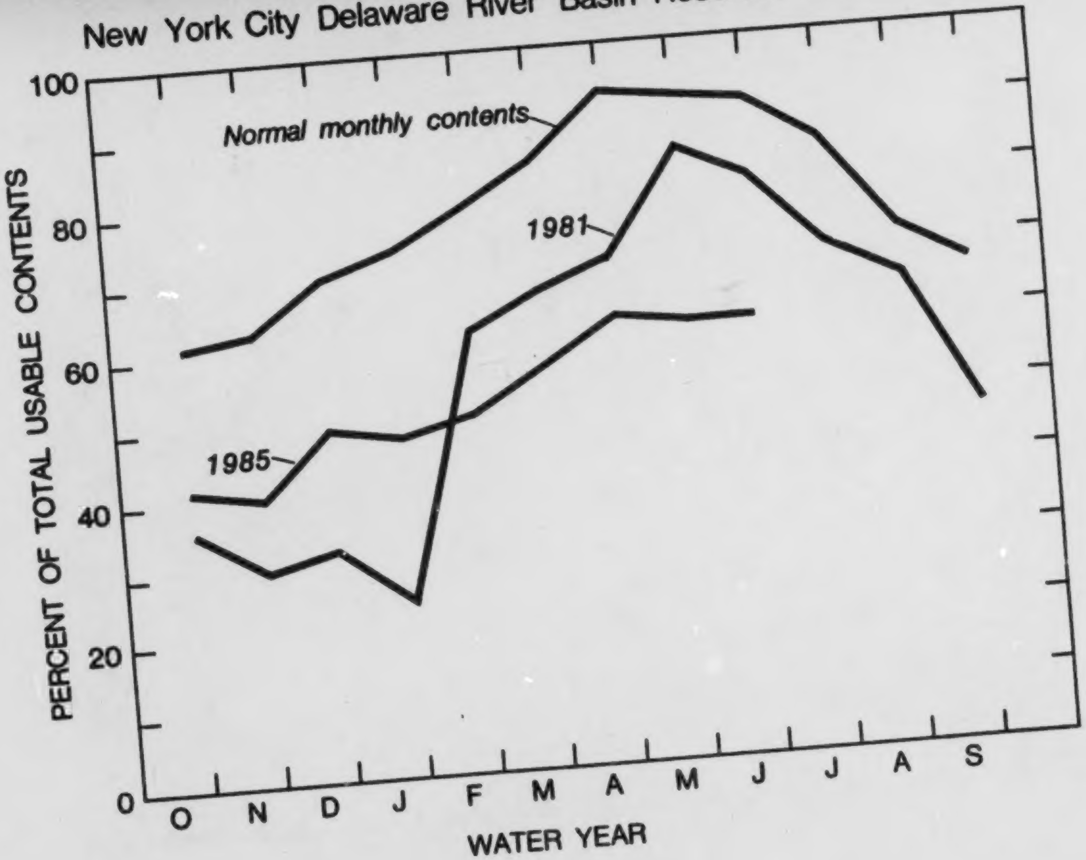

NEW YORK
PENNSYLVANIA
SUSQUEHANNA R.
MASSACHUSETTS
HUDSON RIVER
CONNECTICUT RIVER
HARTFORD
CONNECTICUT
NEW YORK CITY
NEW YORK
NEW JERSEY
DELAWARE RIVER
FALL LINE
TRENTON
PHILADELPHIA
PENNSYLVANIA
MARYLAND
DELAWARE

Northeast Drought Area

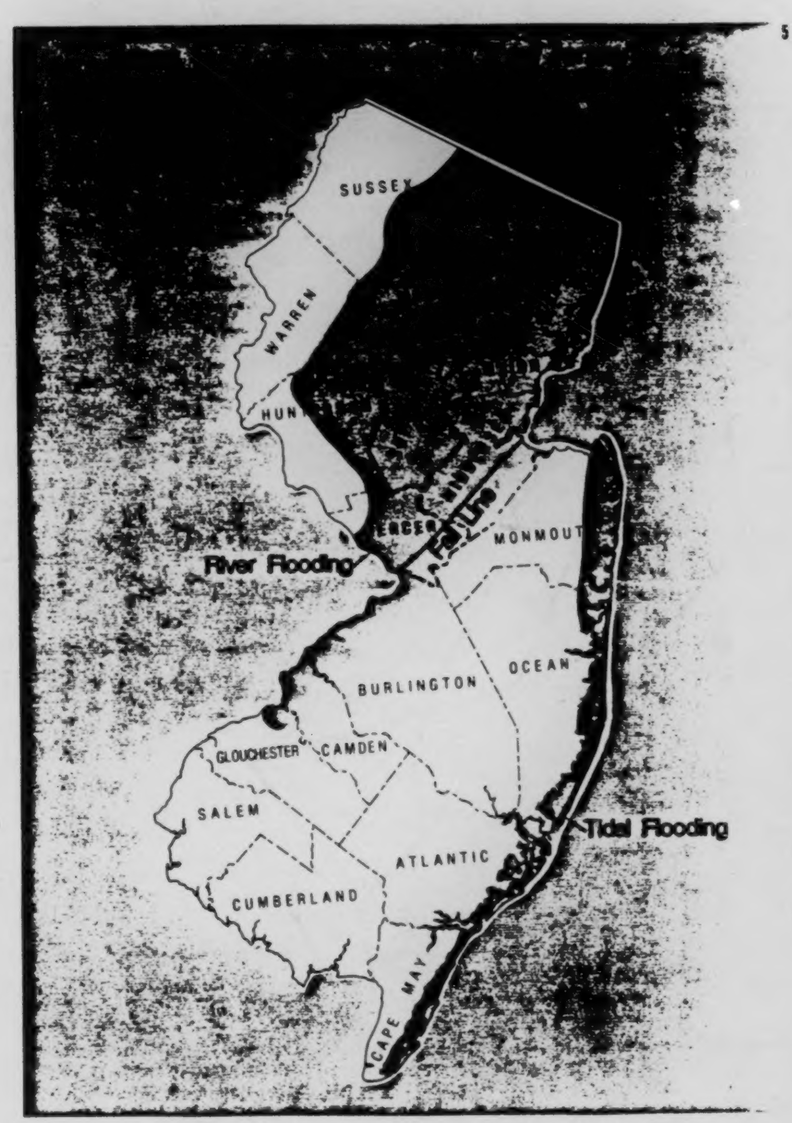

NEW YORK
CONNECTICUT
MONTAGUE
NEW YORK CITY
PENNSYLVANIA
NEW JERSEY
PHILADELPHIA
TRENTON
DEL

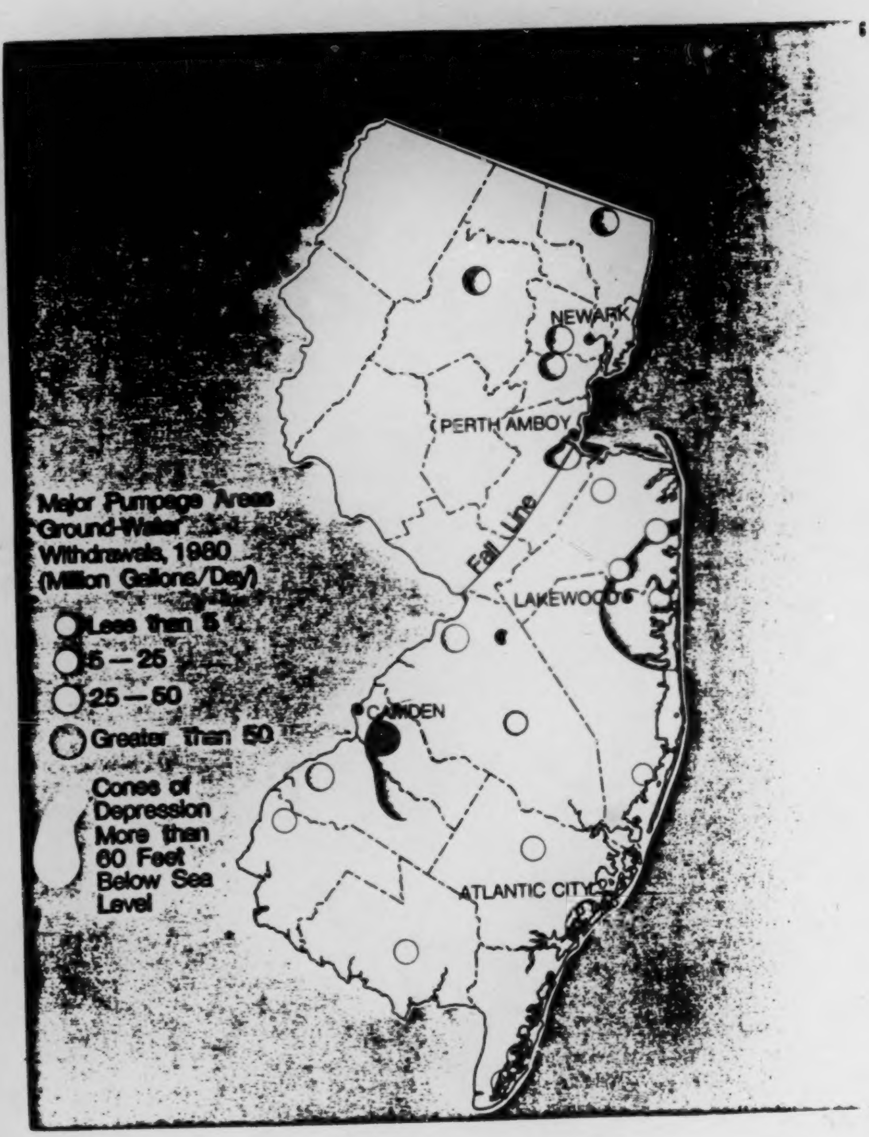
Major Water Features of the Northeast Drought Area


NEW YORK CITY DELAWARE SYSTEM
SCHOHARIE RES.
NEW YORK CITY CATSKILL SYSTEM
CANNONVILLE RES.
WEST BRANCH
PEPACTON RES.
SHANDAKEN TUNNEL
EAST BRANCH
ASHOKAN RES.
NEW YORK
PENNSYLVANIA
NEVERSINK RES.
RONDOUT RES.
DELAWARE
CATSKILL
HUDSON RIVER
CONNECTICUT
Chelsea Pumping Station
AQUEDUCT
AQUEDUCT
LACKAWAXEN R.
RIVER
NEW YORK
NEW JERSEY
MONTAGUE
NEW YORK CITY
PASSAIC
RIVER
LEHIGH RIVER
DELAWARE
LONG ISLAND
RARITAN
DELAWARE & RARITAN CANAL
NEW JERSEY DELAWARE SYSTEM
TRENTON
SCHUYLKILL RIVER
PHILADELPHIA
CAMDEN
PENNSYLVANIA
DELAWARE
WILMINGTON
0 10 20 MILES

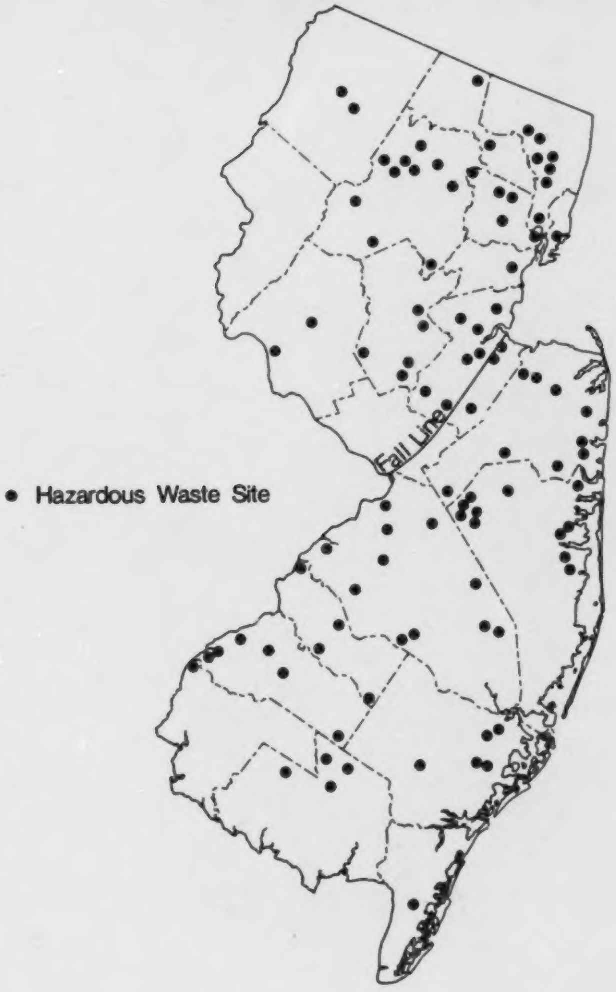


New York City Delaware River Basin Reservoir Contents


5
SUSSEX
WARREN
HUN
ERCER
Fall Line
MONMOUT
River Flooding
BURLINGTON
OCEAN
GLOUCHESTER
CAMDEN
SALEM
ATLANTIC
Tidal Flooding
CUMBERLAND
CAPE MAY


NEWARK
PERTH AMBOY
Fall Line
LAKEWOOD
CAMDEN
ATLANTIC CITY
Major Pumpage Areas
Ground-Water
Withdrawals, 1980
(Million Gallons/Day)
Less than 5
5 — 25
25 — 50
Greater Than 50
Cones of
Depression
More than
60 Feet
Below Sea
Level

Hazardous-Waste Sites in New Jersey


Fall Line
● Hazardous Waste Site

## U.S. Geological Survey State Cooperators for New Jersey

- New Jersey Department of Environmental Protection
- Delaware River Basin Commission
- Passaic Valley Water Commission
- Northern New Jersey Water Supply Commission
- County of Bergen
- Camden County Board Chosen Freeholders
- Morris County Municipal Utility Authority
- Somerset County Board Chosen Freeholders
- Townships of Logan, Bridgewater, Cranford, and West Windsor

## USGS Technical Assistance for Planners and Managers

- Real-Time Water Information
- Surface-Water and Ground-Water Availability
- Surface-Water and Ground-Water Quality Assessments
- Surface-Water Models
- Ground-Water Models
- Water-Use Information

Senator **Bradley**. Thank you very much, Dr. Peck.

Thank you for the helpful review; your charts and maps help us to understand the most important water issues.

You mentioned that increased population was the reason for increased consumption. I guess the real question is: Is per capita consumption increasing as well? Also, what can you predict about future per capita consumption?

Dr. **Peck**. I think for that, I'll turn to Mr. Cohen, our Chief Hydrologist.

Mr. **Cohen**. I'm uncertain about the trends in this particular area, but the general rule of thumb we use throughout the country is something on the order of magnitude of 100 gallons per day per capita.

In the area that we're discussing today, it's about 180 gallons per day per capita. And there are probably a number of major regions with heavy industry, which are larger users of water, and the old major metropolitan areas, where water-distribution systems are just insufficient. So I think the message, although I'm not being fully responsive to your question, is that per capita use is high.

Senator **Bradley**. How does it relate to elsewhere in the United States?

Mr. **Cohen**. It's considerably higher than many places in the United States.

Senator **Bradley**. Do you have specific statistics?

Mr. **Cohen**. As I indicated, the general rule of thumb we use is about 100 gallons per day per capita throughout the United States. In this region it's about 180 gallons per day per capita.

Senator **Bradley**. 180 gallons per day, versus 100. What would it be in drier regions such as Arizona? Would be consumption under 100?

Mr. **Cohen**. Arizona uses a lot of water for irrigation.

Senator **Bradley**. I'm interested in the water consumption of a typical dry State.

Mr. **Cohen**. It's lot easier with a State like Idaho, Senator McClure's State. It would be under 100 million. I hesitate with Arizona because of the fact that there's a lot of intensive irrigation in Arizona, and irrigation is probably the largest consumer of water.

Senator **Bradley**. The number we want to focus on is 100 gallons per day nationally, and in the mid-Atlantic region 180 gallons per day.

Mr. **Cohen**. That's sort of a rule of thumb.

Senator **Bradley**. To what extent is this high consumption rate attributable to a leaky distribution system?

Mr. **Cohen**. That's certainly a major factor.

Senator **Bradley**. What are other factors?

Mr. **Cohen**. Major industry.

Senator **Bradley**. So you have major industries that use water, and you have a leaky system.

Mr. **Cohen**. That pretty well capsulizes it; yes.

Senator **Bradley**. I noticed in your presentation that the New York water delivery system is fairly long. One of your boards indicated that there are two tunnels that come from the reservoirs on the Delaware, from there water travels by aqueduct into New York City.

Would you describe that in greater detail?

Mr. COHEN. These are large diameter concrete tunnels, by and large. I think the largest diameter——

Mr. SCHAEFER. Nineteen and one-half feet.

Senator BRADLEY. So it goes from a reservoir on the Upper Delaware to an aqueduct, then through Westchester County and down through New York City. Is that right?

Mr. COHEN. By and large.

Senator BRADLEY. When were these tunnels built?

Mr. COHEN. Some of the tunnels associated with the Croton system in southeastern New York are more than 100 years old.

Senator BRADLEY. A hundred years old!

Mr. COHEN. More than 100 years old. And the distribution system related thereto in New York City, some of them are more than 100 years old.

Senator BRADLEY. What's the condition of those facilities?

Mr. COHEN. I think it's fair to say they range widely from reasonably good shape to those that are in very poor shape.

Senator BRADLEY. What does that mean—very poor shape? Are we on the brink of a major break?

Mr. COHEN. Well, there are breaks occurring in these types of systems all over the country. And the frequency of breakage does increase as the systems become older.

Senator BRADLEY. How much longer does the system have before it will require major repair?

Mr. COHEN. That's not in my own personal area of expertise, but certainly I've read about it and heard about it, and it's a matter of dispute. There are some who will say that the economics in the water-supply situation as exists right now would argue for major repair now. There are others who say we can go on putting patches on it for decades.

Senator BRADLEY. OK, you've told us what each side is; what do you think?

Mr. COHEN. I prefer to defer to my professional colleagues in the Bureau and in the corps. They do that type of business.

Senator BRADLEY. In your testimony also, you mention that in New Jersey, 12 of the largest 25 water suppliers can meet demand only when rainfall is greater than average. Why?

Dr. PECK. Well, they have inadequate reservoir and delivery systems, and so they have to meet increased demand from other systems, interbasin transfers——

Senator BRADLEY. You mean the size of the reservoir is inadequate? How would you compare the size of the average reservoir in North Jersey with those in New York City?

Dr. PECK. I'll defer to Mr. Cohen.

Mr. COHEN. They're much smaller; much, much smaller.

Senator BRADLEY. Could you give us numbers?

Mr. COHEN. Oh, on the average—to give you a sense—the average reservoir in northern New Jersey might be a mile or so—you have small reservoirs and small watersheds, whereas the major reservoirs in the New York City system are many miles in length.

Senator BRADLEY. Has the development and growth in north Jersey outpaced the reservoir system?

Mr. COHEN. I'd say it's generally recognized that the reservoir system in north Jersey is a point under severe stress in terms of its ability to deliver water; yes.

Senator BRADLEY. Do we need bigger reservoirs?

Mr. COHEN. There are a number of options. Bigger reservoirs are one option. More reservoirs are another option.

Senator BRADLEY. Any other options?

Mr. COHEN. Yes. there are some other management strategies. Some would claim that more elegant and more sophisticated management of reservoir systems can, in fact, increase the efficiencies of such systems.

What has been developed is a series of models—mathematical models—using optimization techniques. And these models are now being used—theoretical models are now being used to develop protocols and guidelines for the movement of water from one part of the system to another. So you can actually adjust the system and balance it.

Senator BRADLEY. What do you mean by "protocols and guidelines"?

Mr. COHEN. Rules. Operating rules.

Senator BRADLEY. Do you mean connecting one reservoir with another?

Mr. COHEN. Yes. And this requires the analytical tools and the cooperation of all the entities who will agree to share water at given times, and you can in fact stretch water supplies by using these techniques. And those techniques, in theory at least, can be applied in any part of the country, including New Jersey.

Senator BRADLEY. USGS is involved in water supply forecasting. What do you see happening in the next 10 years? Should we expect continued drought warnings in the Middle Atlantic region?

Mr. COHEN. Traditionally, we do not get involved in such activities. This is the realm, primarily, of the National Weather Service, and they are having great difficulty doing long-range forecasting in the time frame that you're making reference to.

On the other hand, USGS does do some predictive-type work. As Dr. Peck indicated, we develop models—tools, formulas, equations, things that you plug into a computer—and we can make forecasts, for example, with regard to the impact of ground water developments in southern New Jersey.

That lends itself to a mathematical approach. You can take the present situation, the present pumpage, and use some of the tools we've developed in New Jersey, and say what in fact will happen 5 years from now or 10 years from now.

Senator BRADLEY. Are you saying you can make predictions regarding ground water usage in the sandy soil south and east of the fall line?

Mr. COHEN. Yes. Now, the reason you can do that with ground water is that the groundwater reservoir is filled over a long period of time. That water has been in storage for thousands of years. Generally, you don't see meteorological fluctuations such as floods and droughts in a ground water body. We look at a ground water body as something that's being recharged at average annual rates.

And that's the reason we have these droughts that we talk about. You see big peaks, 2 or 3 years of high flow and reservoirs are full; 2 years of low flow and the reservoirs are being drained. Ground water reservoirs don't behave that way. They respond to man's direct stress—pumping, for instance. We can handle that mathematically.

Senator **Bradley**. Therefore, considering New Jersey as one example, you can't predict future supply in the northwest part of the State which uses surface water because of variations in rainfall, et cetera. But you can predict the ground water in the area of New Jersey southeast of the fall line.

What can you tell us about the quantity of water that exists? How it is likely to vary over the next 5 to 10 years?

Mr. **Cohen**. Regarding the amount of groundwater in storage—you have thousands of feet of sediment that are saturated with water, orders of magnitude greater than the amount of water in the reservoirs on the surface. You have a very, very large amount in the ground. And that amount has been and is going to be there for a long time.

The cones of depression, the yellow areas that Dr. Peck made reference to—these are some of the types of problems that you can associate with heavy pumpage of ground water.

So, therefore, from our point of view, I would frame your question as saying, what can you tell me about the aerial extent of these cones of depression and their depth in the future? How will they deepen, and what will the impact be?

The first impacts, as water levels decline, on folks who have shallow wells, is that their wells go dry.

Senator **Bradley**. I don't live in that part of the State that has the sandy soil. I live in the part of the State that has the glacial formation. But I get my water from a well.

Now, I have to go down 180 to 200 feet in order to get potable water. What about the people in the southeast part of the State? How far do they have to go down?

Mr. **Cohen**. Generally, much shallower than 160 feet. It depends upon the topography, but generally much shallower than that.

Now, if you want a large capacity well with a lot of yield, much more than your domestic well, then the industry will drill a well that may be 500 or 1,000 feet deep. They'll put a deep well in so you can get a very high capacity well.

When they put that deep well in, a big industry or a big municipal well, they begin to pump that well and cause water levels to decline. And folks living down the street who have a little shallow domestic well that's only 30 feet, that well may go dry. That's one measure, very local but important measure, of what one can predict.

Traditionally, if you begin pumping very hard next to the seashore, salty ground water will begin to move in.

Senator **Bradley**. Again, can you give us any comparative number that would help us understand the quantity of ground versus surface water?

Mr. **Cohen**. At least thousands, and perhaps tens of thousands times more than the amount of surface water in storage at this area. Does that give you a magnitude?

Senator **Bradley**. That helps put it in perspective.

Is that water that's in the ground?

Mr. COHEN. Fresh, potable water.

Senator BRADLEY. Fresh, potable water is orders of magnitude, thousands of times, greater than all the water in the reservoirs in the rest of the State.

Mr. COHEN. Yes. You can just visualize the dimensions. With regard to the Coastal Plain to New Jersey, we're dealing with 100 miles at least, to perhaps 150 miles long, and at least a third of a mile thick by, say, 25 miles wide. You're talking about cubic miles of fresh water.

Senator BRADLEY. Please repeat those dimensions.

Mr. COHEN. Its 100 miles times 25 miles times perhaps one-third of a mile thick on the average—but it may be thicker than that—of fresh-water bearing sediments. It's a vast amount of water in the Coastal Plain, and that's the reason you have all that development in the Coastal Plain. It's an easy and inexpensive place to get water.

Senator BRADLEY. Is that ground water sufficient to supply the entire State?

Mr. COHEN. It certainly could. The question would be, for how long a period of time? And again, getting back to our modeling efforts, our models are designed to respond to questions of the type you're posing.

If someone would tell us that we propose to extract so much water from the Atlantic Coastal Plain, for whatever purpose, to serve New Jersey or transport it to Alaska for that matter—whatever purpose—we'll be able to tell you within certain limits the extent, the magnitude of the drawdown, and the extent and magnitude of salt-water encroachment. And these are the quantitative problems you're looking at.

We haven't talked about water quality yet.

Senator BRADLEY. Well, let's say that you wanted to replace half of the water demand of the areas that now depend on reservoirs. Could you do it?

Mr. COHEN. Physically, you could do it.

Senator BRADLEY. What do you mean? Could it be done without depleting the water supply? Would the recharge be sufficient to maintain the present level of supply?

Mr. COHEN. You could physically remove that amount of water and ship it elsewhere for sustained periods of time.

There are two questions—the economic feasibility of doing that. That's one issue, and you'd have to assign some dollars to that as opposed to the other alternatives. And second, we'll have to get a little more precise as to what we mean by sustained periods of time. That will depend on how accurate our models are able to predict, and how accurate the inputs are.

Someone is going to have to tell us, we want this amount of water and this is how we are going to dispose of it. You have two endpoints. If the water is withdrawn from the ground and all consumed by evaporation, it's all gone. If the water is withdrawn from the ground and returned back to the ground with an adequate quality, you have a completely different set of circumstances.

So the answer to your question must lie between those extremes, and if you return to the ground in a willy-nilly fashion, you're going to cause yourself a lot of mischief—and also more of those little red dots.

If you're careful about what you're returning to the ground, you can recycle many, many times.

Senator **Bradley**. So essentially it depends on how you manage it.

Are you saying that with proper management, you could supply half of the needs of those who are now dependent on reservoirs by groundwater pumpage?

Mr. **Cohen**. I think with the qualifications I've given you, yes—considering the vast amount of water that's readily available and in the framework of the qualifications I gave you.

Senator **Bradley**. Well, I find this extremely interesting. You mentioned water quality, I assume, proper management means that you don't create any more toxic waste dumps, and that you clean-up existing sites. Is that correct?

Mr. **Cohen**. As a minimum, yes.

Senator **Bradley**. Please expand on that statement.

Mr. **Cohen**. Well, are remaining issue is do you do with the contaminated ground water that's in the ground? If you don't create the dumps and/or if you clean these dumps up, you then prevent additional ground water from becoming contaminated.

Senator **Bradley**. How much of the groundwater is contaminated now?

Mr. **Cohen**. These again are very crude numbers. The numbers that one hears nationwide are on the order of 1 to 2 percent. In New Jersey it might be somewhat higher. But again you're dealing with a vast volume of water and very narrow, little plumes of contaminated water. It's very difficult to get a precise number, especially when you're talking about three dimensions.

As you get shallower and shallower, you can rest assured that a larger percentage of the water is contaminated. I could do some guessing in terms of the total volume, but it would be misleading. It's a small percentage. But if that small percentage includes one particular plume with a very obnoxious or dangerous compound, you either abandon it or you contemplate cleaning up that plume. And there have been very few plumes in the United States that have been cleaned up because it's terribly expensive.

Senator **Bradley**. I'd like to get back to your point about cost. You could take the water out of the southeast part of the State, the Pine Barons area, please weigh the cost of doing that versus the cost of making other changes, for example, interconnections or additional reservoirs in the northwestern or northern part of the State. What would be your guess on the relative costs?

Mr. **Cohen** [nods in the negative].

Senator **Bradley**. I was just going to give you a chance.

Dr. **Peck**. There's another alternative which has been discussed, but it's an alternative that we're working on with the State agencies on. And that is to develop some of the ground water in the glacial aquifers—like the source of your water—to supplement the surface water supply in times of drought. That may be a more cost-effective way of meeting the problem.

Senator **Bradley**. Any number you can attach to that? That might be a way to meet the problem, but what part of the problem? Is this an academic exercise?

How many more equivalent reservoirs, given the average reservoir size, would this be?

Mr. **Cohen**. I'll be somewhat bold and tell you it's small.

Senator **Bradley**. It's small?

Mr. **Cohen**. It's convenient, and for local water supply in northern New Jersey, it's kind of neat. When you're talking about water management of the scale you've been alluding to, it's small.

Senator **Bradley**. Can we discuss pricing issues farther?

Mr. **Cohen**. I'm not qualified. I'd be delighted if I could, Senator Bradley. I just don't know. We've not gone through that exercise, and I would not want to try to pull numbers out of the hat, which would merely be a recollection of numbers generated by others.

Senator **Bradley**. OK. Let me just raise one other issue with you, and again I don't know if this is your area. New York's water supply needs have been estimated to be $9 billion for rehabilitation of drinking water plants; $11 billion, for a third tunnel to New York City; and $18 billion for construction and rehabilitation of sewers. That's $38 billion that New York says it needs for its water supply system.

New Jersey, on the other hand, in 1981, passed a bond issue for $350 million, which when spent, will more or less take care of New Jersey's needs.

Is the capital need that greatly different—$38 billion versus $350 million?

Mr. **Cohen**. I'm familiar with the very large numbers associated with the New York City system, but again it largely is a result of reading the works of others. So that's the order of magnitude that——

Senator **Bradley**. Are you saying that New York set its water supply system structure many years ago by a very expensive capital investment, so that replacing it would be expensive as compared with smaller reservoirs and interconnections.

I'm trying to understand that number; isn't that why?

Mr. **Cohen**. No; I think some of the details of the hydrology and geology that Dr. Peck and I made reference to are critical. And I will try to summarize it very, very briefly.

Except for the Buroughs of Queens and Brooklyn, the remainder of New York sits on crystalline rock. There is no significant amount of ground water beneath those parts of New York City. New York City had to import water from some other source. There was a lot of ground water in Brooklyn and Queens, but that's a long story; that water is now gone, and they're using the same imported water.

So virtually the entire 1.4 billion gallons per day required to supply that metropolitan area has to be imported from a considerable distance.

Now, the Atlantic Coastal Plain sediments that New Jersey——

Senator **Bradley**. A considerable distance refers to 90 miles?

Mr. **Cohen**. Yes.

The Atlantic Coastal Plain sediments that New Jersey is blessed with, which gives you this rich ground water reservoir system, those same sediments are on Long Island.

Senator BRADLEY. Excuse me.

Mr. COHEN. Those same sediments—those same Coastal Plain materials—underlie Long Island. So you have a population in the two counties that are east of New York City—Nassau and Suffolk—a population that is probably on the order of 4 million people that rely totally and utterly upon the ground water beneath them. But that little portion of Long Island that is now New York City—Queens and Kings County—their ground water is gone, and they're importing all the water from upstate.

The types of plumbing systems that you have to develop to distribute water coming in from a great distance is a very complex network. The sewer systems are a very complex system. Because of those impermeable rocks beneath parts of New York City, one could not dig a small hole in the ground and get rid of your sewage. Nassau and Suffolk County were using cesspools and septic tanks exclusively until about 10 or 15 years ago. They had only one major sewage treatment facility.

New York City has been in the business of treating the sewage for several hundred years, albeit questionable as to how good or bad the treatment was, or is.

So you have a dramatically different situation. You have a small island of rock, in a sense, importing water from great distances, distributing it through literally thousands of miles of buried pipe beneath Manhattan, for example, collecting the wastes through thousands of miles of buried pipe. These pipes undoubtedly are leaking.

Senator BRADLEY. Please repeat your last phrase.

Mr. COHEN. Are leaking. They're corroded. They're old. The New York City subway system which was driven through Kings and Queens County, was driven through those counties when ground water levels were drawn way down. Ground water levels were brought down. Pumping was discontinued and ground water levels began coming up: and now they've got to pump those subways very, very intensively to get rid of this water. But it may no longer be potable water. The water which has come back up again is an admixture of water largely from leaky water mains and leaky sewer pipes. It is no longer getting recharged from precipitation because Brooklyn and Queens are impervious. They're covered with streets and roof tops.

That's why I said, for practical purposes, their ground water is gone. That's a very old system; it's a very complex system. It's an area of 7 million people in a small area geographically.

Senator BRADLEY. Small in what way?

Mr. COHEN. Aerially—the city itself. And I would venture a guess—it's nothing more than that—but I would venture a guess that a large proportion of the numbers that are being talked about, a large percentage—I'm not sure how large—but a significantly large percentage of the billions of dollars that have been talked about—are viewed in someone's mind's eye to address the kinds of problems I just described to you.

Senator **Bradley**. That is extremely helpful. As you describe the problems, they appear gigantic. In New Jersey, we're blessed with this enormous quantity of water, while problems exist due to smaller reservoirs, we don't have the problem of the bedrock crystalline, nor do we have the problem of the extremely large and sophisticated distribution and sewer system; is that correct?

Mr. **Cohen**. Correct.

Senator **Bradley**. Well, I want to thank both of you very much for your testimony. It's been very informative, and I appreiciate your taking the time to be with us today.

Thank you very much.

Our next witness will be Richard Atwater, who is the Special Assistant to the Commissioner of Reclamation.

He will be sharing the panel with the Corps of Engineers. Brig. Gen. Paul Kavanaugh, why don't you come to the table as well?

Thank you both very much for coming and, Mr. Atwater, would you proceed.

## STATEMENT OF RICHARD W. ATWATER, SPECIAL ASSISTANT TO THE COMMISSIONER OF RECLAMATION, DEPARTMENT OF THE INTERIOR

Mr. **Atwater**. That's very fine. I do appreciate it and will just enter my testimony for the record.

As you probably are well aware in looking at our testimony, the Bureau of Reclamation was established in 1902 with the primary purpose, as you had indicated in your earlier remarks—our expertise and responsibility of mission has been in the Western United States, primarily the 17 Western States, in that part of the West, turn of the century, with the main mission of promoting economic development in the 17 Western States, with the understanding that water was the key to developing the West. And I think our record speaks for itself, and my testimony goes through that history in much detail, so I will not spend a lot of time talking about that.

Our experience in drought management, water resources development for both municipal and rural systems and particularly in irrigated agriculture, I think, speaks well both nationally and internationally. We've done work throughout the world in those areas. And we certainly would avail ourselves to the issues and concerns of the mid-Atlantic region and certainly would be happy to participate and assist technically by providing the engineering and hydrologic expertise that we could to analyze those problems and assess what possible options may be available both economically and technically, that are feasible to implement, that can resolve some of the current drought problems that you have today.

Just for information purposes—and it's somewhat noteworthy—we do have a cooperative agreement with the Army Corps of Engineers, where we cooperate conjunctively on studies and efforts particularly in the Western United States.

Second, our sister bureau in the Department of the Interior—the U.S. Geological Survey—talked a little bit about ground water management. Last year Congress authorized the Bureau of Reclamation and the USGS to develop a ground water recharge demonstration program in the western 17 States. We will be implementing that program on October 1 of this year.

And that may be of some technical assistance to the State of New Jersey and the mid-Atlantic region, and maybe would be something that would be worth considering. Although our efforts primarily are focused in the Western United States, ground water recharge is an area where we would be available to provide technical assistance to New Jersey and the mid-Atlantic region.

And I'd just put a footnote to that, because there is concern; Phil Cohen, the Chief Hydrologist of USGS, made some very salient points regarding water quality. As a part of that, we have just recently executed an agreement with EPA to coordinate that ground water recharge work, and look at ground water quality impacts, and that certainly—as they pointed out in their visuals—ground water quality is an important issue in the mid-Atlantic region, like it is throughout the country. We are certainly cooperating with EPA and with the USGS in analyzing those types of issues.

I am prepared to answer any questions that you may have about the Bureau of Reclamation and what kinds of resources we have available to potentially assist in analyzing some of the problems at hand.

[The prepared statement of Mr. Atwater follows:]

# Statement of Richard W. Atwater
Special Assistant to the Commissioner of Reclamation
Representing the Department of the Interior
Before the Senate Subcommittee on Water and Power Resources
of the Senate Committee on Energy and Natural Resources
Concerning the Bureau of Reclamation's Procedures and Capability
to Provide Technical Assistance to States

July 22, 1985

## HISTORY

The Bureau of Reclamation was established by the Federal Reclamation Act of 1902. Under that act, the Congress authorized construction of Federally financed water projects to reclaim by irrigation arid lands west of the 100th meridian. That covered the States of California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming, and the Territories of Oklahoma, New Mexico, and Arizona. In 1906, the Congress added Texas to the coverage area.

Under the 1902 Act, money from the sale of public lands in Reclamation States and Territories was placed in a revolving Reclamation Fund to be used for construction of irrigation projects. The act also provided for repayment by project beneficiaries of more than 80 percent of total project construction costs. The Secretary of the Interior was given broad authority to implement and administer the program and the Reclamation Service was established as a part of the Department of the Interior's Geological Survey. The Reclamation Service became a separate Interior entity in 1907. In 1923, the name of the agency was changed by Secretarial order to the Bureau of Reclamation.

Principal objectives of the Reclamation program were (1) reclaiming arid western lands by irrigation; (2) fostering agricultural development of the reclaimed lands; and (3) bolstering the national economy by encouraging development of western lands. Earlier legislation intended to encourage western settlement helped shape the content and purposes of the 1902 Act. The Homestead Act of 1862 enabled settlers to acquire 160 acres of western land by farming it and living on it for 5 years. The necessity for bringing water to the land was recognized in the Desert Land Act of 1877, which permitted acquisition of larger parcels of arid land providing the acreage applied for was reclaimed and irrigated within 3 years. The Carey Act of 1894 was intended to permit individuals or local organizations to develop irrigation projects on land previously owned by the Federal Government. It failed in its purpose because local interests lacked the financial and engineering capabilities for large-scale projects. But the Carey Act and the other acts designed to stimulate western settlement and development set the stage for the Reclamation program.

The Reclamation Act of 1902 incorporated and enlarged upon features of the earlier land laws. The act made available the Federal funding and engineering expertise necessary for construction of the large irrigation projects that transformed the dry and thirsty land into productive crop acreage. Under the act, farmers could obtain water for up to 160 acres of land providing the users were willing to sign contracts for repayment to the Federal Treasury of over 80 percent of the project costs; the Reclamation Reform Act (Public Law 97-293) of October 12, 1982, increased the acreage limitation to 960 acres for a qualified recipient. The remainder of the cost was for public benefits, for example, flood control. Water was available for irrigation as soon as project construction was completed. Initially, irrigation was the primary purpose for which the Congress authorized Reclamation projects. Dams were built creating reservoirs for water storage, and canals and ditches were constructed to convey the irrigation water to the land. By 1906, the Congress had recognized the benefits to be derived from hydroelectric power generation at Reclamation dams and from the sale of project water to serve western communities and industry. Completed dams also provided built-in flood control. Growing demands for water-oriented recreation and for enhancement of fish and wildlife habitat led to project authorizations; e.g., Public Law 89-72, for those additional public purposes. Today, most Reclamation projects are authorized for multipurpose uses which include irrigation, municipal and industrial water, hydroelectric power generation, recreational opportunities (including fish and wildlife), and flood control. The Water Supply Act of 1958 provides authority for Federal participation and cooperation with States in developing water supplies for domestic, municipal and industrial uses. Currently, a number of Reclamation studies are addressing the municipal and industrial water needs of various areas.

The Reclamation Act of 1902 required that a major portion of funds derived from sale of public lands within each Reclamation State be used for Reclamation projects in that State. By 1910 some 15 projects had been authorized - at least one in each Reclamation State, at an estimated ultimate cost of $376 million. The first Reclamation works were completed in 1906, bringing irrigation to some 22,000 acres which produced crops valued at more than $245,000 annually. Today, the Bureau of Reclamation has 161 authorized projects built or under construction at a total estimated completion cost of $21,442,000,000, more than 84 percent of which has been or is being repaid to the Federal Treasury by users of project water and hydroelectric power.

## COST SHARING

From the start of this Administration, the President and the Secretary of the Interior have been committed to rebuilding and strengthening the foundations of the Federal-State water project partnership. Several important steps have been taken by the Bureau of Reclamation to establish a framework within which the development of much-needed, environmentally-sound and economically prudent water projects can proceed. The Bureau of Reclamation believes that the President's cost-sharing letter of January 24, 1984, provides the appropriate basis on which future water project financing will rest.

## PROJECT FACILITIES

Project facilities include 336 storage reservoirs, 349 storage or diversion dams, 15,444 miles of canals, 1,119 miles of pipelines, 249 miles of tunnels, 35,081 miles of laterals, 15,925 miles of project drains, 215 pumping plants of over 1,000 horsepower, and 49 powerplants. Project water is supplied to meet full, supplemental, and temporary irrigation needs for more than 10 million acres of land. Over 19 million people in the 17 Reclamation States receive municipal or industrial water supplies. Outdoor recreation opportunities at Reclamation reservoirs attract millions of visitors. Flood control provided by Reclamation dams and reservoirs presents an estimated $111 million in damages prevented each year.

Many of the dams and reservoirs, canals, tunnels and powerplants built by Reclamation are world-famous. Some of these are the Hoover Dam, which controlled the Colorado River; the All-American Canal built through the shifting sands along California's Mexican border; the Alva B. Adams Tunnel, which pierces Colorado's Continental Divide; and the Third Power Plant of Grand Coulee in Washington, which houses the largest hydroelectric generators in the world.

## CURRENT INVOLVEMENT

Presently, Reclamation is helping to meet the needs of millions of people by providing water for irrigation, clean hydroelectric power, water for homes and factories, outdoor recreation, flood control, fish and wildlife enhancement, improved water quality, river regulation and control, and other related uses of water. We use a wide variety of expertise to: (1) investigate water supply, distribution, and quality problems, both surface and ground water; (2) formulate cost-effective and viable solutions to problems, both structural and non-structural; and (3) construct, operate and maintain and manage water supply systems and projects for irrigation, municipal and industrial, and hydropower purposes, as well as for recreation, fish and wildlife. Reclamation's expertise in dealing with water related problems evolves from over 80 years of experience in planning, constructing, operating, maintaining and managing water systems. We work primarily with States and local interests in planning for and developing water supply and delivery systems and addressing specialized problems. We have one of the Nation's major applied research centers for water development located in Denver, Colorado, which tests, evaluates, and develops the latest materials and methods for water supply and delivery.

In addition, the Congress has asked us to take initiatives in such specialized areas as atmospheric research (weather modification), ground water and salinity control. We have over 20 years experience in testing and development of weather modification techniques for augmenting water supplies. While cloud seeding technology has yet to be conclusively proven effective as a means of producing more water, Reclamation and other agency research has narrowed the uncertainty and pursued efforts to define appropriate seeding strategies for specific regions. Cooperative programs have been completed or are underway in the States of North and South Dakota, Kansas, Oklahoma, Texas, Arizona, Colorado, Utah, California, Nevada and Delaware, as well as in Panama, Morocco, and in the Canary Islands. Reclamation's involvement in State cloud seeding programs includes providing planning, technical assistance, continuing research, project evaluation, and technical management when funds are appropriated for the latter purpose.

## SALINITY CONTROL

Controlling salinity in the Colorado River Basin as a means of improving the water quality for those who utilize the river as a source of supply is a major area of involvement which largely benefits southwestern States and Mexico. Reclamation's water quality program identifies problem areas, develops alternative control plans and recommends remedial actions, including construction of salinity control units. Research activities include the investigation of the relationship between irrigation efficiency and salt loading, land and channel processes contributing to the salt load from diffuse sources, evaporation and cost reduction, the phenomenon of salt precipitation in reservoirs, and desalting pretreatment and water characterization studies.

## LOAN PROGRAM

Reclamation loan programs provide assistance to non-Federal entities; e.g., States, irrigation districts, who wish to construct or improve water resource developments. These programs are conducted under the authority provided by the Small Reclamation Projects Act (Public Law 84-984) and the Distribution

System Loans Act (Public Law 84-130). Those acts encourage State and local participation in developing water and land resource projects and construction of distribution systems on Federal projects.

## REHABILITATION AND BETTERMENT PROGRAM

The Rehabilitation and Betterment (R&B) program is administered by the Secretary of the Interior through the Bureau of Reclamation to facilitate the R&B of irrigation systems on projects governed by Federal Reclamation law. Any water user entity organized under State statutes and whose existing irrigation system is part of a project authorized and governed by Federal Reclamation law is eligible to participate in the R&B program. Federal funds are made available for the replacement or improvement of irrigation structures and systems which have deteriorated or become obsolete to the extent the cost of the work is more than can be funded by the water user entity, except as a long-term obligation.

## GROUND WATER

In the planning, design, construction, and operation of water resources projects, Reclamation integrates ground-water considerations as a matter of practice. Reclamation provides a bridge between the data-gathering, scientific investigations of the U.S. Geological Survey and regulatory focus of the Environmental Protection Agency. Reclamation projects are directed toward conjunctive use of ground water and surface water to better manage the resources available to meet society's demands. Techniques may include artificial ground-water recharge, reversible recharge and pumping, ground water use in lieu of or in addition to surface supplies, and water quality improvement for both surface and ground-water resources. Public Law 98-434, dated September 28, 1984, authorizes Reclamation to study the potential for artificial ground-water recharge in the 17 Western States and to demonstrate artificial recharge technologies under a variety of hydrogeologic conditions. The program will consist of a minimum of 21 demonstration sites, 12 of which will be located in the High Plains States (Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, Wyoming) and nine in the other Reclamation Act States.

## "TECHNICAL ASSISTANCE TO STATES" PROGRAM

Reclamation's "Technical Assistance to States" program is specifically designed to assist the 17 Western States, upon request, in water management and evaluation of instream flow requirements. Data, technical knowledge and expertise are provided to the States to aid in their allocation of water resources, including maintenance of low-flow regimes and user needs. These data are organized into a form useful to the States in managing instream-flow, ground-water and water quality problems. The States also are provided assistance in the technical aspects of evaluating all phases of the management of water as a resource.

## FOREIGN ACTIVITIES

Reclamation has a history of international cooperation dating back to 1910. We have provided technical assistance to over 60 countries of the world and have trained 4,000 water resource engineers and scientist from over 80 countries. Currently, we have 23 resident staff stationed in eight foreign countries and active programs in four others (China, Spain, Israel, and Sudan) but without resident staff. All technical assistance and training programs are fully reimbursed to Reclamation by another Government agency, an international organization, or a foreign government.

## RESPONSIBILITIES

Our approach to dealing with water problems is multidisciplinarian in scope including engineering, economic, financial, operational, management, environmental and social. Our projects must be cost-effective, viable, and environmentally sound. We do comprehensive river basin planning and engineering studies. Conservation alternatives are included as an integral part of our studies. Although we work primarily in the 17 Western States, we have on occasion been involved in work in several eastern areas including weather modification in Delaware and a desalting plant in North Carolina.

We deal with large complex systems as well as small specialized ones. We assist States in developing plans for conjunctive use of surface and ground water, river basin management, and water project rehabilitation. We use and develop modern management techniques to assure optimal use of existing water resources - such as river basin management.

We are active in resolving water quality problems. We have accomplished or are studying alternatives for removal of pollutants from project sites. Our chemical and soils laboratories can ascertain acceptable or unacceptable levels of various hazardous pollutants in the soil or water. We have had success in removing and replacing PCB-laden oils from transformers near hydroelectric projects. We have done studies of alternatives for handling toxic substances at our water project sites.

We are drought and water quality experts dealing with the most current and pressing water supply and delivery problems in urban and rural areas. We work with States and localities in developing practical and cost-effective solutions to meet water needs. We do this with conservation planning, engineering expertise, and management techniques. We also assist States in dealing with institutional and legal issues relating to water supply and delivery.

Some examples of Reclamation projects are as follows:

Central Valley Project - This project is one of the Nation's major water conservation developments. Initial project features were built to protect the valley from severe water shortages and devastating floods. Although developed primarily for irrigation, the multipurpose project also provides flood control, improves Sacramento River navigation, supplies domestic and industrial water, generates electric power, conserves fish and wildlife, creates recreation opportunities and enhances water quality. The Central Valley Project is a portion of the California Water Plan, prepared by the State in the 1920's, which it was unable to finance by itself. Therefore, the State turned to the Federal Government for assistance and funds for construction of the initial features of the project were provided by the Emergency

Relief Appropriation Act of 1935. A second part of the California Water Plan, the California Water Project, the State was able to finance and construct without Federal assistance. Legislation is currently pending before the Congress to coordinate the operations of the Central Valley Project with the State Water Project.

Columbia Basin Project - This is a multipurpose project located in central Washington. The principal feature is the Grand Coulee Dam which is on the main stem of the Columbia River west of Spokane. Project irrigation facilities are designed to deliver a full water supply to over one million acres of land previously used for dry farming or grazing. Currently, over 500,000 acres actually are receiving an irrigation water supply. Power production facilities at the dam are the largest in the world. The total generating capacity is rated at about 6.5 million kilowatts. Interest in irrigating with Columbia River water occurred in the early 1900's when large numbers of homesteaders moved into the project area and discovered that dry farming was not to be a successful venture. Engineering and economic studies by various organizations and governmental agencies eventually resulted in recommendations to construct the high Grand Coulee Dam at its present site and pump water to the Grand Coulee area. Construction of the project was assigned to the Bureau of Reclamation and funds were made available by the Public Works Administration in 1933.

Fryingpan-Arkansas Project - This multipurpose transmountain diversion development is located in southeastern Colorado. It diverts up to 69,200 acre-feet of surplus water from streams located on the western slope of the Rocky Mountains to the eastern slope. The diverted water in combination with available water supplies in the Arkansas River Basin provides for supplemental irrigation of over 280,000 acres in the valley. The project also provides eastern slope municipalities with an annual water supply of over 40,000 acre-feet. Initial studies by Reclamation on the project began in 1936. It was authorized for construction in 1962.

## EMERGENCY ASSISTANCE

The Bureau of Reclamation also provides personnel and equipment to the Federal Emergency Management Agency (FEMA) for disaster assistance during declared emergencies in determining property damages.

When the President of the United States declares a disaster area because of severe floods or other national disasters, FEMA is authorized to use other Federal agencies, such as the Bureau of Reclamation, to assist in restoring damaged facilities. An example of Reclamation assistance in such an emergency followed the 1976 summer flood disaster in the drainage area of the Big Thompson River in Colorado that resulted in loss of life and caused extensive property damage, including destruction of numerous irrigation facilities. FEMA officials used experienced engineers, employed by Reclamation, for assessing damages and in expediting the restoration of essential irrigation structures.

The Drought Assistance Act of April 7, 1977 (Public Law 95-18), authorized an emergency fund for Reclamation to make grants and loans to mitigate the effects of severe drought conditions that occurred in the late 1970's. Grants were given to States for general wide-spread drought mitigation programs (such as cloud seeding, public awareness, etc.), to Federal and State Fish and Wildlife agencies for mitigating fish and wildlife losses by providing supplemental sources of water, and to Federal agencies (Reclamation and the Bureau of Indian Affairs) for drought-related studies. Loans were made to irrigation organizations on Federal, Indian, Small Reclamation, and non-Federal irrigation projects for purposes such as construction of new wells and improvements to existing distribution systems to make more water available during the drought. Loans for similar purposes also were made to individual irrigators who received water from Federal projects.

In summary, Reclamation has the capability and expertise to assist States and others in dealing with their water-related problems and needs.

Senator **Bradley**. Thank you very much, Mr. Atwater.

General Kavanaugh, please give your testimony and then we'll proceed to questions jointly.

## STATEMENT OF BRIG. GEN. PAUL F. KAVANAUGH, DIVISION COMMANDER, NORTH ATLANTIC DIVISION, U.S. ARMY CORPS OF ENGINEERS, ACCOMPANIED BY ROBERT CALLEGARI, CHIEF, PASSAIC RIVER BASIN STUDY GROUP, NEW YORK DISTRICT; AND SALVADORE BUCOLO, ASSISTANT CHIEF, PLANNING AND ENGINEERING DIVISION, U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT

General **Kavanaugh**. Thank you very much, Senator.

Senator **Bradley**. Please dim the lights so we can see the general's slides.

General **Kavanaugh**. Could I add one point to what Mr. Atwater brought up. In the western part of the United States, there have been many times when the Bureau of Reclamation has sat beside the corps, or the district engineer in Sacramento. We turned over the last dam I worked on, which is New Melones Dam—we turned that over to the Bureau of Reclamation in 1979.

Mr. Chairman, with me today are Mr. Robert Callegari, chief of the Passaic River Basin Study Group, New York District; and Salvadore Bucolo, assistant chief of planning and engineering division at Philadelphia District.

I welcome this opportunity to appear before you to discuss the Corps of Engineers activities related to water supply in the States affected by the Delaware River Basin; namely, New York, Pennsylvania, New Jersey, and Delaware.

This is a particularly appropriate time to assess the water supply problems of the region because of the almost continual annual water shortages experienced in the 1980's in the Delaware River Basin, New Jersey, and the New York City Metropolitan Area.

It should be noted that in the New York City Metropolitan Area, the majority of its water comes from the Delaware River Basin. This graph shows the current storage problems of the New York City system.

[Slide.]

National policy on water supply, defined by Congress, has been developed over a number of years, yet is still being clarified and extended by legislation. This policy recognizes a significant Federal interest in the long-range management of supplies, but generally assigns the financial burden of supply to users. Municipal and industrial water supply is considered a primary responsibility of municipalities or other non-Federal entities. However, M&I storage space may be included in the Corps of Engineers' multipurpose reservoirs.

[Slide.]

If such storage space is economically justified and represents the least cost alternative, it may be added to any project at any time. Modification of existing projects for this purpose which would seriously affect the project, its other purposes, or its operation, requires congressional authorization. Such storage capacity, under present policy, may be reserved exclusively for water supply or may be provided by joint use of seasonal flood control or other storage. Costs allocated to water supply are totally a local responsibility. The administration's position would require payment by a local sponsor, during the period of construction, of all constructions costs allocated to water supply.

[Slide.]

The sponsor must also agree to continue to pay their share of annual operation and maintenance [O&M] costs allocated to the water supply storage, together with their share of the costs allocated to any necessary reconstruction, rehabilitation, or replacement of any features which may be required to operate the project. The Federal Government makes no representation with respect to the quantity or quality of water, and assumes no responsibility therefor, or for the treatment of water.

[Slide.]

A gap between dependable supply and demand was projected in the corps Northeastern United States water supply study, which hereafter will be referred to as NEWS, which was completed in July 1977. This study recommended further studies of what is popularly known as the Hudson River project.

[Slide.]

This project is one which should be considered for construction by local interests to provide the New York City metropolitan area a safe yield of 390 million gallons a day.

[Slide.]

North Atlantic Division updated the NEWS report in response to a request in the fiscal year 1983 Supplemental Appropriations Act. The update found four key elements to the problem, which are as shown.

[Slide.]

We believe that there is a continuing need for increased attention to these problems at all levels of State and local government.

Under existing policy and law, the corps has the authority to investigate multiple purpose projects. An example is our ongoing effort in the Longwood Valley Reservoir in northern New Jersey which is investigating augmentation of available supplies.

In response to this year's water shortage, New York City has formed a task force under the leadership of Deputy Mayor Robert Esnard, to assess new sources of water. Our New York district will have a member on that task force.

[Slide.]

Prior to NEWS—from 1958 to 1960—the corps conducted a major study of the Delaware River Basin. The study report recommended a series of projects, a total of 19, including the 8 authorized corps project shown in this slide, and the programs for the timed and balanced development of the basin water resources. This report formed the basis of the original comprehensive plan adopted by the Delaware River Basin Commission. From the report, Congress authorized six multipurpose lakes with water supply storage and modification of two flood control lakes to include water supply. Four projects, shown in the bold print, are active. Beltzville and Blue Marsh have been constructed.

[Slide.]

Francis E. Walter modification is in advanced engineering and design, and will be completed with funds requested in fiscal year 1986, and Prompton Lake modification is awaiting funding for initiation of advanced engineering and design. The four other authorized projects, Tocks Island, Maiden Creek, Aquashicola, and Trexler, have not proceeded due to local opposition to their immediate construction.

In addition to aiding in the development and revision of basin plans, and construction of Federal water supply projects, the corps and non-Federal interests have been cooperating to overcome or minimize the effect of water shortage in the basin.

[Slide.]

The Good Faith Agreement entered into in 1981 by the four Delaware River States and New York City was necessitated by the realization that, under drought conditions, the previous schedule of diversions, releases and flow objectives could not be met. Therefore, the agreement calls for a series of flow management, water diversions and conservation measures.

[Slide.]

Its provisions call for early modification of two existing Corps of Engineers water supply projects—That's F.E. Walter and Prompton—to add water supply features; and two State projects—Merrill's Creek, NJ, and Cannonsville, NY. A larger corps project, Tocks Island, is to be held in reserve status to meet the needs beyond the year 2000.

[Slide.]

At the request of the Delaware River Basin Commission, the Corps of Engineers has, during the 1980's, stored emergency water in space normally reserved for flood control storage which is as shown.

[Slide.]

In addition to basinwide and project-specific efforts, the corps has two continuing authorities that permit water supply investigations. Section 22 of Public Law 93-251 and section 214 for New York State only of Public Law 89-298 authorize the corps to cooperate with States in the preparation of comprehensive plans for the development, utilization, and conservation of the water and related land resources of drainage basins within the boundaries of the United States.

During the 1980's, in the Delaware River Basin regional area, we have complied with the States' requests to concentrate our efforts under these authorities to water supply aspects of regional plans. Under section 22, the corps has spent nearly $1.5 million since 1980 in the Delaware River Basin States. Under section 214, we have spent $308,000 since 1980. These funds have been utilized to provide technical assistance for a variety of needs such as the development of a maintenance and rehabilitation program for a Jersey City major supply aqueduct in the conduct of ground water studies.

[Slide.]

The corps also gets involved in water supply through three other programs: emergency operations, permits, and mobilization.

For emergency operations, the corps has very limited authority under Public Law 95-51 to construct wells and to transport water to farmers, ranchers, and political subdivisions within the areas which the Chief of Engineers has determined to be drought-distressed after total capacity of the non-Federal sector has been utilized.

However, we have not had to invoke this authority because of the efficiency of the State water resource agencies. In the case of a presidential declaration of a major disaster or emergency, we can act under the aegis of FEMA. This occurred in the 1980–81 time period when FEMA asked us to evaluate various State-proposed methods of alleviating the water shortage crisis during this period in the State of New Jersey.

[Slide.]

Permits under the Rivers and Harbors Act of 1899 and the Clean Water Act, Department of the Army permits are required prior to construction of dams, reservoirs, and water withdrawal strucutures. The corps, as administrator of this program, is committed to expeditiously process permit applications for these activities. In the Delaware River Basin, we have issued permits for a major water supply project at Point Pleasant, which is in Bucks County, PA, and water withdrawals for several new powerplants. We are currently processing an application for new pump storage water supply reservoir at Merrill Creek, NJ, and have received preliminary inquiries from the State of New York regarding expansion of the existing Cannonsville Reservoir on the East Branch of the Delaware River.

[Slide.]

### MOBILIZATION

The corps is presently involved, along with other Federal agencies and the States, in ongoing emergency water planning which would be implemented subsequent to a declaration of national emergency, such as mobilization. These plans, when developed, will deal with the management, control, allocation and use of water resources of the Nation to ensure its readiness to respond to catastrophic national security and domestic emergencies.

[Slide.]

Mr. Chairman, this concludes my prepared remarks. I have additional material which I'd like to provide for the record, which goes into the details of the update of the NEWS report.

I'd be very happy to receive your questions at this time.

[The prepared statement of General Kavanaugh follows:]

STATEMENT

OF

BRIGADIER GENERAL PAUL F. KAVANAUGH

DIVISION COMMANDER

NORTH ATLANTIC DIVISION

CORPS OF ENGINEERS

ON

WATER SUPPLY ACTIVITIES

OF THE

CORPS OF ENGINEERS

BEFORE

THE SUBCOMMITTEE ON WATER AND POWER
COMMITTEE ON ENERGY AND NATURAL RESOURCES

JULY 22, 1985

NOT FOR RELEASE
UNTIL RELEASED BY THE
COMMITTEE ON ENERGY AND NATURAL RESOURCES

## TESTIMONY BEFORE COMMITTEE ON ENERGY AND NATURAL RESOURCES, 22 JULY 1985

Mr. Chairman, Members of the Committee, I am Brigadier General Paul F. Kavanaugh, Commander of the North Atlantic Division of the Corps of Engineers. I welcome this opportunity to appear before you to discuss the Corps of Engineers activities related to water supply in the states affected by the Delaware River Basin; namely, New York, Pennsylvania, New Jersey and Delaware.

This is a particularly appropriate time to assess the water supply problems of the region because of the almost constant annual water shortages experienced in the 1980's in the Delaware River Basin, New Jersey, and the New York City Metropolitan Area.

National policy on water supply, defined by Congress, has been developed over a number of years, and is still being clarified and extended by legislation. This policy recognizes a significant Federal interest in the long range management of supplies, but generally assigns the financial burden of supply to users. Municipal and industrial water supply is considered the primary responsibility of the municipalities or other non-Federal entities. However, M&I storage space may be included in Corps of Engineers' multipurpose reservoirs. If such storage space is economically justified and represents the least cost alternative, it may be added to any project at any time. Modification of existing projects for this purpose which would seriously affect the project, its other purposes, or its operation, requires Congressional authorization. Such storage capacity, under present policy, may be reserved exclusively for water supply or may be provided by joint use of seasonal flood control or other storage. Costs allocated to water supply are totally a local responsibility. The Administration's position would require payment by a local sponsor, during the period of construction, of all construction costs allocated to water supply.

The sponsor must also agree to continue to pay their share of annual operation and maintenance (O&M) costs allocated to the water supply storage, together with their share of the costs allocated to any necessary reconstruction, rehabilitation, or replacement of any features which may be required to operate the project. Storage space for raw water is provided. The Federal government makes no representation with respect to the quantity or quality of water and assumes no responsibility therefor, or for the treatment of the water.

A gap between dependable supply and demand was projected for this area in the Corps Northeastern United States Water Supply (NEWS) Study which was completed in July 1977. This study recommended further studies of what is popularly known as the Hudson River project. This project is one which should be considered for construction by local interests to provide the New York City Metropolitan Area a safe yield of 390 million gallons per day.

North Atlantic Division updated the NEWS report in response to a request in the FY 1983 Supplemental Appropriations Act. The update found four key elements to the problem: (1) increasing deficits; (2) system failure through infrastructure decay; (3) deteriorating ground water quality; and, (4) a need for emergency planning and implementation. We believe there is a continuing need for increased attention to these problems at all levels of state and local government.

Under existing policy and law the Corps does have the authority to investigate multiple purpose projects. An example is our ongoing effort on the Longwood Valley Reservoir in Northern New Jersey which is investigating augmentation of available supplies.

In response to this year's water shortage, New York City has formed a Task Force under the leadership of Deputy Mayor Robert Esnard, to assess new sources of water. Colonel Griffis of the New York District has been asked to serve as a member of the task group.

Prior to NEWS (from 1958 to 1960), the Corps conducted a major study of the Delaware River Basin. The study report recommended a series of projects (19 Total - 8 Corps) and programs for the timed and balanced development of the Basin water resources. This report formed the basis of the original comprehensive plan adopted by the Delaware River Basin Commission. From the report Congress authorized six multipurpose lakes with water supply storage, and modifications of two flood control lakes to include water supply. Four projects are active, Beltzville and Blue Marsh have been constructed (39,830 and 14,650 acre feet of water supply, respectively). Francis E. Walter modifiction (70,200 acre feet) is in advanced engineering and design and will be completed with funds requested in FY 1986, and Prompton Lake modificaton (28,000 acre feet) is awaiting funding for initiation of advanced engineering and design. The four other authorized projects, Tocks Island, Maiden Creek, Aquashicola and Trexler, have not proceeded due to opposition to their constructon.

In addition to aiding in the development and revison of basin plans, and construction of Federal water supply projects, the Corps and local interests have been cooperating to overcome or minimize the effect of water shortages in the Regional area. The Good Faith Agreement entered into by the four Delaware River States and New York City was necessitated by the realization that, under drought conditions, the former schedule of diversons, releases and flow objectives could not be met. Therefore, the Agreement calls for a series of flow management, water diversions and conservation measures. Its provisions call for early modifiction of two existing Corps of Engineers projects to add water supply features (Francis E. Walter and Prompton) and two state projects: Merrill's Creek, NJ and Cannonsville, New York. A larger Corps project, Tocks Island, is to be held in reserve status to meet needs beyond the year 2000.

At the request of the Delaware River Basin Commission, the Corps of Engineers has during the 1980's stored emergency water in space normally reserved for flood control storage is as follows:

| Year | Project | Storage (gallons) |
|---|---|---|
| 1985 | Walter | 11,300,000 |
| 1985 | Blue Marsh | 1,710,000 |
| 1981-1982 | Walter | 11,300,000 |
| 1981-1982 | Blue Marsh | 1,710,000 |
| 1981-1982 | Prompton | 1,150,000 |

In addition to basin wide and project specific efforts, the Corps has two continuing authorities that permit water supply investigations. Section 22 of Public Law 93-251 and Section 214 (New York State only) of Public Law 89-298 authorize the Corps to cooperate with States in the preparation of comprehensive plans for the development, utilization and conservation of water and related land resources of drainage basins within the boundaries of the U.S. During the 1980s, in the Delaware River Basin Regional Area, we have complied with the States' requests to concentrate our efforts under these authorities to water supply aspects of regional plans. Under Section 22, the Corps has spent nearly $1.5 million since 1980 in the Delaware River Basin states. Under PL-214 we have spent $380,000 since 1980, all for water supply assistance.

The Corps also gets involved in water supply through three other programs; Emergency Operations, Permits, and Mobilization.

(1) Emergency Operations. The Corps has very limited authority under PL 95-51 to construct wells and to transport water to farmers, ranchers and political subdivisions within areas which the Chief of Engineers has

determined to be drought-distressed after the total capability of the private sector has been utilized. However, we have not had to invoke this authority because of the efficiency of the State Water Resource Agencies. In the case of a Presidential Declaration of a "Major Disaster" or "Emergency", we can act under the aegis of FEMA. This occurred in the 1980-1981 time period when FEMA asked us to evaluate various state-proposed methods of alleviating the water shortage crisis during this period in the State of New Jersey. The Corps, under authority of Section 22 of PL 93-251, has cooperated with the Basin States in their planning of water supply resources for emergency use.

(2) Permits. Under the Rivers and Harbors Act of 1899 and the Clean Water Act, Department of the Army permits are required prior to construction of dams, reservoirs and water withdrawal structures. The Corps, as administrator of this permit program, is committed to expeditiously process permit applications for these activities. In the Delaware River Basin, we have issued permits for a major water supply project at Point Pleasant (Buck's County) and water withdrawals for several new power plants. We are currently processing an application for a new pumped-storage water supply reservoir at Merrill Creek and have received preliminary inquiries from the State of New York regarding expansion of the existing Cannonsville Reservoir on the East Branch of the Delaware River.

(3) Mobilization. The Corps is presently involved, along with other Federal agencies and the States, in ongoing Emergency Water Planning which would be implemented subsequent to a declaration of a national emergency such as a Mobilization. These plans, when developed, will deal with the management, control, allocation and use of the water resources of the nation

to insure its readiness to respond to catastrophic national security and domestic emergencies.

Mr. Chairman, this concludes my prepared remarks. I have an additional statement I would like to provide for the record, which goes into the details of the update of the NEWS report.

I would be happy to answer any questions you may have on Corps activities in the area of water supply.

Senator Bradley. Thank you very much, General Kavanaugh and Mr. Atwater, for your testimony. As the responsible parties nationally on this issue, I think that you've added an additional dimension to the hearing.

I'd like to come back to some of the questions that I asked earlier, but why don't we deal with your testimony first?

General Kavanaugh, you mentioned that the NEWS study was completed in 1977. Yet, in the last 5 years we've had on-again, off-again drought problems in the Northeast. From the testimony, it wasn't clear to me—how much will the Hudson River project go toward solving that? And how accepting is New York of that project?

I have information recently that they began to draw water from the Hudson River. That would indicate that the idea is one that they could accept.

General Kavanaugh. If you go back to what the study said, sir, it would provide approximately 400 million gallons a day. If that project was on-line right now, we would not be having the problems that we do in New York City today.

At the time that the study came out, I was not in the job I'm in now, but checking back it appears that there was some reluctance on the part of the State to move forward.

What's happened is, we haven't had a sustained drought long enough to force a decision to address some of these problems. We go through a period of a couple of years when we have a drought, and then we get some more water. What's happened was shown on the demand curve that I showed in my statement. We are really in the second year of a drought. So when we started off into this spring, we already were down.

The mathematics that control the water supply for New York City makes an assumption that we're close to 100 percent at the start of the season. This year we were considerably below it, but still we're in no peril because when you look at the key element statistically, which is days of supply of water, there is 180 days of supply remaining.

But what happens is, we may get through this summer all right, have a fairly good winter, and then the problem will be such that we can limp along.

Well, we're to the point now where we're in worse shape now than we were back in the 1960's. Part of this is because the water demands are greater now than they were then. And the second portion is, we are slightly below the reservoir storage, we were then. The situation regarding those two, which is really looking at supply and demand—is slightly worse off now than we were then.

Senator **BRADLEY**. You mean in total gallons of water that is stored, we're below 1960?

General **KAVANAUGH**. Right today, we're slightly below actual stored water.

Senator **BRADLEY**. And demand, as we heard from Mr. Cohen, has increased.

General **KAVANAUGH**. Yes, sir; the city is now pumping over 100 million gallons a day, which they weren't able to do back in the early 1960's. So what's happened is, that provides 100 million of the about—I guess it's 1,200 millions gallons a day that the city is currently using. It is helping out.

Senator **BRADLEY**. You mean they're pumping 100 million more than in 1960?

General **KAVANAUGH**. Yes, sir.

Senator **BRADLEY**. Although the agreement was 800 million diverted from the river?

General **KAVANAUGH**. I'd have to deter to my staff on that one.

Mr. **CALLEGARI**. I think the general——

Senator **BRADLEY**. Who is this?

General **KAVANAUGH** This is Bob Callegari.

Mr. **CALLEGARI**. The general is alluding to the Chelsey Pump Station, that's its on-line capability right now.

Senator **BRADLEY**. But my point is that New York is now pumping from the Hudson River, what is that present capability to pump without the Hudson River project? The Hudson River project is 390 to 400 million gallons. How much can they pump now, without the Hudson River project?

General **KAVANAUGH**. OK. I had to check. They're pumping the capacity of the plant now, which is 100 million gallons a day.

Senator **BRADLEY**. And that's the capacity?

General **KAVANAUGH**. That's the installed capacity of the Chelsey plant, pumping to capacity.

Senator **BRADLEY**. So did the Hudson River project assume that that would be at capacity?

General **KAVANAUGH** The Hudson River project assumed a total capacity of about 1,000, and would yield 400 million gallons a day.

Senator **BRADLEY**. Of that 400, the Hudson River would now make up 300 and Chelsey——

General **KAVANAUGH**. The Hudson River project was the skimming project, and what it relied on was catching of snow melt early in the spring, while water quality was to be maximized. And you pull that water off, and put it into your reservoirs, and that would start you off at approximately 100 percent of your storage for the year.

One of the luxuries that New York has is, they don't have to run their water through a very sophisticated water treatment plant which takes the bad taste out. That's why New York water tastes very good.

Senator **Bradley**. Because they don't have to——

General **Kavanaugh**. They don't have to do some of the same work on their water purification as you would find someplace down at New Orleans, who starts out with initial water quality not as good as the water quality that you start with up in New York.

Senator **Bradley**. Have you ever tasted water out of a well in the Pine Barrens?

General **Kavanaugh** No, sir.

Senator **Bradley**. Then you haven't tasted water.

You talked about an agreement in 1981 among the four States. What precedent might that have set? As I sit here and listen to the way water is delivered in our region, it strikes me that there could be a lot better integration of water supply needs and available sources.

What are your thoughts about that?

General **Kavanaugh**. Certainly there could be.

But what you have to look at is that you've got a couple of problems. You can do interbasin transfers which look fine on paper until you realize it's highly possible to end up having interbasin transfers between two dry basins, which is where we are right now.

We can look mathematically, at having the Susquehanna in really bad shape at the same time as the Delaware. This wouldn't happen too often.

But if you look at, say——

Senator **Bradley**. Well, then wouldn't you make the same argument about interconnections among reservoirs?

General **Kavanaugh**. Interconnecting among reservoirs can make good sense. For example, in New Jersey as you know, some of the reservoirs recently were dumping water, while some others were short. There has to be more cross-connections done to maximize the water resources within the State.

I think that's true.

Senator **Bradley**. But getting back to the region. So you say it makes some sense to look at the Hudson River, the Delaware River Basin, and the Susquehanna Basin as one whole system, if we're looking at surface water. Is that correct?

General **Kavanaugh**. That's right.

Senator **Bradley**. And yet, our plans don't look at it as one whole system. What would we need to do, what kind of questions would we need to ask if we were going to look at it as one whole system?

General. **Kavanaugh**. You need to look at the big issues raised by the New York City metropolitan area water supply study: at deficits, at infrastructure, at ground water and emergency drought planning. As to deficits, its a question of demands versus supply. A first question you have to look at is: What is your demand? Well, I think that's already covered by the first speaker. Demand, far and away, is easy to come up with. And then it's a matter of saying on the next step, what available resources that you have, and then what land area we're talking about.

When you look at the supply, there's plenty of water out there. It's in the wrong places or it's uneconomical to get it. You can look at your house where you go down 160 feet. At about 240 feet, you get to the point where a two-stage pump isn't going to do any good, sir. You're just going to start throwing money at it.

So you look at it and you say——

Senator **Bradley**. That's when I move.

General **Kavanaugh**. Right.

You say that the supply is there, but the economics of getting it may not be viable. And what you have to do is look at it by a series of those iterations, because just because the water is there, you then go into overall economics. We looked at Tocks Island. Tocks Island was a very good project. As you know, we almost went forward to construction with that. The Federal Government still owns the land. If Tocks Island right now was on line, you wouldn't be having the problems that you do in New Jersey and that area now. You'd have plenty of water to take care of it, because we're not talking about tremendous amounts of water.

What happened when I was getting ready for the presentation is, people use millions of gallons a day, which doesn't mean anything to me. I was in Sacramento. The Bureau of Reclamation changed my thinking from millions of gallons a day to acre-feet. And when I ground out what acre-feet was for some of these dams, we're not talking——

Senator **Bradley**. I think that might be helpful to just draw that distinction.

General **Kavanaugh**. One million gallons a day is 3.07 acre-feet. So when you're looking at these dams that we're talking about, we're not talking about tremendous areas, surface areas, or volumes. When you look at acre-feet and the amount of water that has to be stored, when you look at the relatively smaller amounts that we talk about up in the Northeastern area, they're not that large.

Senator **Bradley**. I think this is an interesting point, and this is where Mr. Atwater might want to chime in. If you're simply looking at the available technology, at what has been done in moving large quantities of water, we're talking here in terms of millions of gallons, and you're saying a million gallons is 3 acre-feet of water.

Let's consider the Central Valley, how much water is moved in the Central Valley? In particular, let's discuss the water supply for Los Angeles. Then discuss the Central Valley in terms of acre-feet and the water supply for Los Angeles in terms of distance. For comparison, in the Northeast, New York City's demand is millions of gallons, transported over 90 miles.

How far does the water go to Los Angeles, and how much in water are we talking about in the Central Valley, just as a means of comparison?

Mr. **Atwater**. As a person who grew up in Los Angeles, I guess I can speak to the source. Los Angeles received about 20 percent of its supply from local ground water, and the rest of it is all imported. At the turn of the century, of course, the city of Los Angeles imported water from the valley, eastern slope of the high Sierras, which is roughly 250–300 miles. With the completion of Hoover Dam in 1935, southern California started importing water from the Colorado River in the 1940's which is a little over 300 miles to the Colorado River Aqueduct.

Then, of course, in the late 1960's, water was imported from northern California through Central Valley project facilities. And if you look at the upper watersheds and the commingling of that water, it goes almost all the way up to the Oregon border. Generally, you're talking about 500–600 miles. Some of that water comes from the Sacramento Valley through the Sacramento-San Joaquin San Francisco Bay delta system, then, of course, south through the Central Valley, and then over the mountains into Los Angeles Basin.

Senator **Bradley**. So that in terms of distance of moving water, the 90 miles that New York has to move water is rather small compared to the distances that other cities have to move water—Los Angeles, for example—500 miles.

Mr. **Atwater**. Yes. Of course, we have under construction right now the Central Arizona project which takes water from the Colorado River east to Phoenix and Tucson, AZ.

Senator **Bradley**. What about quantities of water?

Mr. **Atwater**. Well, in the Central Valley, the Bureau of Reclamation delivers a million acre-feet per year, as opposed to a million gallons per day. I'll give you a rough translation.

Senator **Bradley**. Million acre-feet per day?

Mr. **Atwater**. Per year.

Senator **Bradley**. Per year.

Mr. **Atwater**. And we deliver through both the Central Valley project, which is a federally financed project and the State water project, roughly speaking, in excess of about 10 to 11 million acre-feet, which, if you multiply that by 1,120, that's roughly billions of gallons per day to over a million acres of irrigated agriculture, and, of course, in excess of 12 million people in southern California and other municipal supplies, to also the San Francisco Bay region and Sacramento.

Senator **Bradley**. What's the price of that water?

Mr. **Atwater**. Well, it varies quite a bit. Hoover Dam was built in the 1930's, and in 1987 it will be just about fully repaid. We sell the Colorado River water at about 50 cents an acre-foot, as congressionally authorized in the 1930's.

Central Valley agricultural water sells for roughly between $3 and $20 per acre-foot. The retail price of that water, when you apply all those associated costs, you live in downtown Los Angeles and you pay for that water from the Metropolitan Water District of Southern California; they sell the water to the local purveyor at roughly $180 per acre-foot. And that includes all the costs of power and moving it through those aqueduct systems.

Senator **Bradley**. That includes treatment costs and transportation?

Mr. **Atwater**. That's correct. That includes the filtration and treatment plant.

Senator **Bradley**. How would that compare to New York City water cost?

Mr. **Callegari**. I don't think we really have direct comparison. I think it would have to be on the basis of replacement cost, because the systems here are so much older and have been on line for long periods of time.

Senator **Bradley**. What is the end cost, the retail cost? Now, here he says the retail cost in Los Angeles is $180 per acre-foot. What's the retail cost in New York City?

Mr. **Callegari**. I don't know that, Senator.

Senator **Bradley**. Staff tells me in northern Virginia, it's about $320 per acre-foot. Can we get such data?

General. **Kavanaugh**. We'll get that for you.

Senator **Bradley**. Because I think it's illustrative. If it is $180 per acre-foot to move water 500 miles in quantities that Mr. Atwater has described, then it would be interesting to know how much it cost to the consumer to deliver water 90 miles. We might then be able to assess degree of subsidy among other things.

So could we get that for the record?

General **Kavanaugh**. We'll get that figure for you, sir.

Senator **Bradley**. OK.

[The information follows:]

Based upon data supplied by the city of New York, it provides approximately 1.2 billion gallons per day for residential users. This corresponds to a storage of 1,344,660 acre feet annually. The city meters about 25 percent of its users. A charge based upon frontage and other parameters is the basis for the remainder. Utilizing the metered rates the charge per acre foot of water is $287.41

Mr. **Atwater**. I'd just add as a footnote, southern California 100 percent financed the aqueduct from the Colorado River to southern California and also the aqueduct the State of California constructed. The State water project provides water to southern California.

Senator **Bradley**. So that essentially, you're saying that whatever subsidy, it's a local subsidy.

Mr. **Atwater**. That's generally correct.

Senator **Bradley**. Is that true in the Central Valley, too? Both sides of the valley?

Mr. **Atwater**. As far as irrigation, certainly there are special subsidies associated with irrigated agriculture in the Central Valley.

Senator **Bradley**. General Kavanaugh.

General **Kavanaugh**. There is a price differential between the State project and the Federal project.

Senator **Bradley**. And what is that price differential?

General **Kavanaugh**. I don't remember.

Mr. **Atwater**. The numbers are roughly, as I quoted, $3 to $20 per acre-foot for the Central Valley project irrigated agriculture water price, versus roughly $22 to $25 for the State water project, although you need to remember the Central Valley project was built roughly 25 years earlier, so it's comparing an old house versus a new house.

Senator **Bradley**. Right.

I'd like to get back to the mid-Atlantic region. Earlier, I read to Mr. Cohen what New York State says would be the cost of redoing its water system. Are those ballpark figures?

General **Kavanaugh**. Those were higher figures than I've heard before. It may be for the total replacement of the system because it is so high. We carry a different figure for the tunnel of around $3 billion, and you gave a significantly larger figure.

Senator **Bradley**. Yes, I did; 3 billion, you have?

General **Kavanaugh**. To complete the first three stages would be about $3 billion.

Senator **Bradley**. Well, mine says $3 to $11 billion. So you took the low and I took the high.

General **Kavanaugh**. That's 1984 funding level we think it would be. Here again, I don't know all the rest that went into their number. We were just looking at that tunnel per se. There could be other peripherals that could be in the distribution system. I don't know all the other things that went into that number

Senator **Bradley**. Considering long-range planning, do you think it would be helpful for us to simply take the existing system and look at rehabilitation of that system or a New Jersey interconnect, or do you think it would be better for us to look at it in terms of the whole region with the three river basins and what we might do to integrate them—along with what the ground water supplies?

General **Kavanaugh**. It is important to look at regions as a whole. The corps can look at multiple-purpose reservoirs for specific solutions and we can be part of studies of large regions. Of course, most water supply problems and solutions are local. Some are regional.

Senator **Bradley**. So you're saying you already look at it as region.

General **Kavanaugh**. We do conceive of the Delaware and Hudson basin, and adjoining States as a region, as we did in the Northeast Water Study, NEWS covers more than just the areas we've talked about now, but actually goes up to the New England States.

Senator **Bradley**. Mr. Atwater, do you have anything to suggest to us, based upon your experience, or based upon the Bureau's experience? I know you cooperate with the corps in the West. Do you see areas that you might cooperate in the East?

Mr. **Atwater**. Certainly, we would welcome any new opportunities to provide a service to the Nation. And we certainly think our experience in the past and currently our cooperative efforts with both the Geological Survey and the corps could be applied potentially to problems in the mid-Atlantic region.

Senator **Bradley**. Could you provide further details on the ground water recharge program?

Mr. **Atwater**. Yes. Congress authorized Public Law 98-434 which allows us over the next 2 years to analyze ground water recharge potential in the 17 Western States and in conjunction with the Governors and State agencies and the U.S. Geological Survey and EPA, to evaluate potential sites and come up with a minimum of 21 demonstration projects whereby you apply surface waters, in the process of technically recharging a ground water aquifer.

Senator **Bradley**. With what? With surface water?

Mr. **Atwater**. That's right. The big issue and potentially analogous to the mid-Atlantic region is that you're talking about the arid West where you may have rainfall of 5, 10, 15 inches in a locale. And we're talking about taking flood flows, municipal sewage, and other sources of water supply and having a mechanism through ground water recharge basins, well systems, whereby recharging an aquifer, will provide in a drought a long term, safe water supply.

Now, our current technologies and practices, for example, in southern California, in Los Angeles, in Orange County, the Los Angeles River which is only closed a few days a year, is used to apply to ground water recharge, and they also utilize a substantial amount of sewage effluent that they recharge into the ground water basin to recharge the aquifers.

Senator BRADLEY. After it's been treated.

Mr. ATWATER. Of course. The city of El Paso has a brandnew plant that technically takes sewage effluent, recharges in the aquifer, and goes directly into the drinking water supply through their ground water recharge mechanism. There are other examples.

Senator BRADLEY. General Kavanaugh, in Mr. Cohen and Mr. Peck's testimony, they mentioned that in northern New Jersey, 12 of the 25 reservoir areas can not meet demand if precipitation is not above average. And he characterized the problem as one of reservoir size and interconnections.

Do you agree with that?

General KAVANAUGH. We do. Our mathematics back up what he said, sir.

Senator BRADLEY. OK.

Should the price of water be reviewed in a different way by the committee or by the Congress? Should we subject the price of water to market forces? Also, if somebody wants to pump water in a certain area and sell it, do you think that they ought to be able to sell it anywhere they choose?

General KAVANAUGH. I don't look at being able to just put down a hole in the ground and pump—you would like to, to make a profit, if it is in the national interest; the reason being, it depends upon your location. If you're fortunate and you're along the coast, you can make a good early profit until salinity comes in that may destroy that aquifer for who knows how long. Or you may have the situation that's occurred down in Florida, where drawdown has actually caused lands to settle. Therefore, some people made their money; other people now are living with the alternative.

Water is a precious commodity. I think what we have to do is establish guidelines and those guidelines have to be such that one State doesn't gouge another State, one area doesn't gouge another area. It's something that is a commodity that has to be shared. We must find that deficits have got to be shared, the same that we find that overages have got to be shared.

You're not going to do that at a local level. Human nature just doesn't work that way. Unfortunately we've got the "I got mine, Jack" syndrome and it makes it very, very difficult. You can take a look at a State like California. You've got a lot of water to the north, but it's not pumping itself, and a lot of rhetoric goes on. And some of it—you figure it's one State; it should have a common way of doing business, and everybody should be behind a common goal. It doesn't work out that way.

The area that we have up in the Northeast, you've got a lot of small areas. Some of them are somewhat fiefdoms as far as water, and they've been like that for a long time. I don't think we can continue that. I think we're going to have to have more cross-connections. We're just going to have to have it.

Within this, we have to make sure that we control the drilling and pumping. We're going to have to make sure that we've got a policy that takes care of the cross-connections that we need. We must maintain our water quality. In essence, what I'm saying is, we need to have this thing overall; somebody's got to be in charge of it. We do this now with the DRBC and the Susquehanna River Basin Commissions—they do a lot of that. I think the problem is a little bigger than that.

Senator **Bradley**. Do you agree with Mr. Cohen, that with proper water management techniques, that vast aquifer in the southeastern part of New Jersey could be utilized to the benefit of the region—or at least the benefit of the State?

General **Kavanaugh**. The economics are that if we continue pumping in that, that may not be the least expensive engineering solution to the problem. That is a solution to the problem. What I've given you on Tocks Island and those other places was the least cost from an engineering and economic standpoint.

Senator **Bradley**. That's lower cost than pumping?

General **Kavanaugh**. What I gave you was a lower cost.

Senator **Bradley**. Could you run us through that briefly? We have to get on, but I'm very interested.

General **Kavanaugh**. OK. The Tocks Island project was about $1.2 billion. Let me check and just verify that.

The Tocks Island project was about $1.2 billion, and that would give——

Senator **Bradley**. This was in what year?

General. **Kavanaugh**. This is a 1984 figure. And that would give you a 765,000-acre feet total capacity, but water storage would be 425,000 acre feet, so that's a significant structure.

Senator **Bradley**. Then how much would the alternative be? How much would the pumping of ground water be?

General. **Kavanaugh**. Well, it was going to be greater. We investigated that alternative. I could get that figure for you.

Senator **Bradley**. Would you get that and provide it for the record?

General. **Kavanaugh**. We can get that figure for you. Yes, sir.

[The information follows:]

We ruled our ground water as a total alternative to the Tocks Island project early in the study and did not cost it out. However, we have evaluated a project which would have provided a safe yield of 200 mgd to northern New Jersey by developing ground water resources in southern New Jersey as part of the Northeastern United States Water Supply [NEWS] Study. The project would have consisted of 200 wells of 1 mgd yield spaced about 2000 feet apart and a 52 mile, 8-foot diameter pipeline. The cost of that project in 1985 dollars would be approximately $700 million. However, the project would involve the Pine Barrens Preserve for which there are serious environmental concerns.

Senator **Bradley**. OK. Let me thank both of you for your testimony and also for your willingness to answer questions, and I'm sure we might see each other again at these tables in the next year or so.

Mr. **Atwater**. Thank you, Senator.

General. **Kavanaugh**. Thank you very much.

Senator **Bradley**. Our next witness is Mr. John Gaston, director of division of water resources, Department of Environmental Protection, State of New Jersey.

Let me welcome you, Mr. Gaston, to the committee. As you can tell from the course of this hearing, we are interested in the long-term questions that are involved with water planning in our region. I appreciate the substantial amount of information that you have provided the committee, and we are anxious to hear your testimony at this time.

I'm sorry that we're going to have to cut it off in 20 minutes, but I hope we will have time for some questions.

## STATEMENT OF JOHN W. GASTON, DIRECTOR, DIVISION OF WATER RESOURCES, NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Mr. **Gaston**. I have about 10 minutes of testimony——

Senator **Bradley**. Very good. That's fine.

Mr. **Gaston** [continuing]. And then you can ask some questions.

Senator Bradley, it's a pleasure to appear before you today to discuss water supply issues of interest to New Jersey and the Middle Atlantic States. Over the past 20 years New Jersey, particularly the urban Northeast, has been faced with three major droughts. Each one has had major economic implications on the State.

In the late 1970's, the department of environmental protection initiated a water supply master plan to analyze the State's water supply needs and to make recommendations on ways to resolve various issues of water quantity in response to the problems pointed out by the droughts.

That program, now partially implemented, has made it easier for the State to manage the effect of the current drought, even though it is potentially the most severe of the three. There is, though, still much to be done as we attempt to implement our long-term water management program in New Jersey.

Such a program must recognize not only New Jersey's unique responsibilities, but the role of the Federal Government as a regional partner in developing those solutions that are needed.

In New Jersey, the public is supplied with water by 620 water companies. This includes several large investor-owned companies, as well as large and small municipal systems and a variety of utility commissions. Most of the functions relating to water management in New Jersey are carried out by the division of water resources in the department of environmental protection.

And we are responsible for water supply planning, allocation of surface and ground withdrawals, and the Federal and State Drinking Water Acts; and, uniquely, New Jersey has a full suite of regulatory capabilities to deal with problems of water management with existing State legislation.

Moreover, other laws and the bond issues that New Jersey has given make the DEP in a better position to deal with the substantial problems that water supply in the Northeast presents. This situation undoubtedly resulted from our experience in the last several years.

New Jersey's concerns with water availability are rapidly evolving in the direction of broader regional needs and programs. The Delaware River Basin has been managed for many years by the Interstate Delaware River basin Commission. We are rapidly approaching a complete interlinkage of the various supplies and water demand centers in the Passaic basin which has helped us a great deal in this drought. And the complex regional systems in the Raritan basin are beginning to be knit together.

Our newest regulatory initiative, water supply management in critical areas, is being developed in the coastal zone areas of the central and southern parts of the State which you talked about earlier today. These areas cover Middlesex, Monmouth, and Ocean Counties, the metropolitan area and Camden County, and the Atlantic City area. In each of these areas, overuse of ground water has seriously depleted the aquifer, drawn pressure levels far below sea level, and threatened salt water intrusion.

We have devised creative and innovative programs to reduce the withdrawals from ground water to the dependable yield of the system and provide alternative sources, mainly from surface water. In these cases, we are receiving excellent technical assistance from the U.S. Geological Survey.

The actual construction of projects necessary to deal with the problems in these areas is likely to be done by individual purveyors, local and county utilities authorities, or perhaps by the State water authority.

This program in the critical areas is adjusting allocations that have been given in the past to communities, taking water away in effect, to balance the amount of water that the ground is capable of producing, with that which the Government has allowed to be taken in the past. And of course, previous decisions were not necessarily done in the most scientifically beneficial environment, and our relationship with USGS has helped us to provide a better environment to make prudent management decisions.

In the Passaic basin, it has been determined that the present system of intakes, pipelines, reservoirs will be sufficient to withstand droughts that last 2 years in duration after the completion of the Wanaque South Project, including the new Monksville Reservoir. That $151 million project is being built by purveyors, probably with the assistance of a loan from the State.

There is also a potential multiple purpose reservoir, one which you know of very well, the Longwood Valley Reservoir which we hope to have the corps' studies completed on and perhaps implemented later on, and your assistance in getting that on the books is much appreciated.

Also of interest in the water supply picture in New Jersey are the F.E. Walter and Prompton Reservoirs which General Kavanaugh spoke about. The Corps of Engineers has had these reservoirs as flood control projects and now they're being modified for additional storage for low flow augmentation in the Delaware River basin to meet New Jersey's commitments under the good faith agreement.

In order for this program to be fully implemented, we will be back to Congress to get necessary authorizing legislation on a rather creative way to pay for the actual implementation of the project.

Looking beyond the year 2000, it will be necessary for New Jersey to find additional sources of water outside its borders. There has long been consideration of obtaining water from the Hudson

River. In fact, the NEWS Study that the General spoke of suggested such a project. The development of such a Hudson River project complements the main objective—one of the main objectives in the New Jersey water supply master plan directed at maximizing the intrastate sources and infrastructure. And by that, I mean we've taken it in our hands to control the things that we could in our master plan to make our infrastructure work in a coordinated and a cooperative manner and to make the best use of the available gallons that New Jersey controls within its States.

At the same time, by implementing that program, we set ourselves up to be able to use water, if additional water came from outside—outside in the Hudson, outside in the Delaware basin, and outside if it becomes necessary to ever draw upon southern Jersey. So we've maximized our infrastrucure in the interest of providing for the future use of a significant amount of additional water at some time in the future.

In view of the length of time that it takes to build a major project such as this, and particularly the conditions that surround the Hudson River that we have all read about in recent years and months, it is not too early to initiate formal planning.

We understand that New York would have a similar interest, and that was covered early in the remarks.

I would be remiss in not commenting especially on the work of the U.S. Geological Survey. We have a major program of hydrologic studies, funded largely by the State under the $350 million Water Supply Bond Act of 1981 and partly by Federal matching funds. These studies are of very great assistance to us. USGS provides the technical assistance of a high order in determining aquifer characteristics and in modeling the responses to foreseen changes due to economic development and modified withdrawals from wells.

First priority has been given to the depleted and threatened aquifers in the coastal plain, but we expect the program to continue in some of the hardrock and buried valley aquifers in northern New Jersey. Many of New Jersey's deeper and more productive aquifers, especially in the Coastal Plain, are relatively well-studied. Continuing investigations of these aquifers focuses mainly on answering questions of a local regional nature—I think is a fair way of saying it—such as closely defining a clay bed that serves to separate two aquifers, or the interaction between two aquifers in response to pumping of a public well.

It's now time to answer some of the more difficult questions regarding ground water supply and hydrology. Many questions regarding ground water supply, ground water contamination, and the movement of contamination in surface/water/ground water interaction concern the uppermost or water table aquifer. New Jersey would be very supportive of a program to define the water table aquifer in the State as a first step toward answering some of these questions.

As part of this program, the establishment of a drought monitoring network would be an invaluable aid to us in assessing the severity and geographic distribution of future drought conditions. Both these projects should and will be implemented cooperatively with USGS.

One last field of possible Federal assistance to the State is engineering and planning from the Corps of Engineers for water system infrastructure improvements. New Jersey has adopted a strict requirement under its Water Supply Management Act rules covering system rehabilitation and management. Purveyors are required to submit and implement programs for the rehabilitation and the long-term maintenance of their system under the State regulations.

This is an important regulatory requirement, given the fact that many of our systems face large deferred maintenance costs. Systems from the corps to organize and manage the development of a framework for the State-mandated technical infrastructure studies would be of great value.

In summary, New Jersey has taken the initiative to plan and manage its water supplies in a forward-looking fashion beginning as far back as 1975 when the master plan for the State was commissioned. Our master plan represents a game plan and our recent progress report, which is included in your package, shows that we are on target for the foreseeable future in implementing a State-based program of water supply improvement.

Our program anticipates a complementary Federal presence to accomplish some of the activities described above. We hope our presentation today will contribute to assisting you in achieving this goal. And, for the record, we are submitting a series of attachments. Our master plan for 1982 is included in full; an update that was done in 1983 is also included. We have a little report that we did, "Improvements in New Jersey's Ability To Withstand Future Drought and Water Emergencies, 'which we did this year in response to a lot of concern that has been raised regarding the drought. And, lastly, we have our package on critical areas management, along with the enabling regulations that serve to frame that program. And if you will recall, that's the program that deals with, in effect, bringing water supplies back into balance and groundwater supplies back into balance with that which is being taken out.

So, with that, I'm ready to answer any questions that you might have.

[The prepared statement of Mr. Gaston follows:]

JOHN W. GASTON, DIRECTOR
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

# TESTIMONY TO THE
# UNITED STATES SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
# SUBCOMMITTEE ON WATER AND POWER

JULY 22, 1985
WASHINGTON, D.C.

Over the past twenty years New Jersey, particularly the northeast, has been faced with three major droughts. Each one has had a major economic impact on the State. In the late 1970's, the Department of Environmental Protection initiated a Water Supply Master Plan to analyze the State's water supply needs and to make recommendations on ways to resolve various issues of water quantity.

That program, now partially implemented, has made it easier for the State to manage the effect of the current drought even though it is potentially the most severe of the three. There is, though, still much to be done as we attempt to implement our long term Water Supply Management Program in New Jersey. Such a program must recognize, not only New Jersey's unique responsibilities but, the role of the Federal government as a regional partner in developing those solutions.

In New Jersey, the public is supplied with water by 620 water companies. This includes several large investor owned companies, as well as large and small municipal systems, and a variety of utility commissions.

Most of the functions related to water management in New Jersey are carried out by the Division of Water Resources of the Department of Environmental Protection. This Division is responsible for water supply planning, allocation of ground and surface water withdrawals, and the Federal and State Safe Drinking Water programs. Moreover, other laws and bond issues of New Jersey have given the DEP greater powers and more substantial funding than those of most states. This situation undoubtedly results from the serious water problems which we have encountered over the years.

New Jersey's concerns with water availability are rapidly evolving in the direction of broader regional needs and programs. The Delaware River Basin, has been managed for many years by the interstate Delaware River Basin Commission. We are rapidly approaching a complete interlinkage of various supplies and water demand centers in the Passaic River Basin, with complex regional systems beginning to evolve for surface water in the Raritan Basin.

Our newest regulatory initiative, water supply management in critical areas, is being developed in coastal zone areas of Central and South Jersey which have relied mainly on groundwater. These areas cover (1) parts of Middlesex, Monmouth and Ocean Counties, (2) the metropolitan area of Camden, and (3) Atlantic County. In each of these areas, over-use of groundwater has seriously depleted the aquifers, drawn pressure levels far below sea level, and threatened salt water intrusion. We have devised programs to reduce the withdrawals from groundwater to a dependable yield for the system, and provide alternative sources, mainly from surface water. In these cases, we are receiving excellent technical assistance from the U.S. Geological Survey. The only other Federal interest directly involved is Section 404 permits from the Corps of Engineers, required when major construction is involved. Actual construction in these cases will be done by individual purveyors, local or county utilities authorities, or by the State.

In the Passaic River Basin, it has been determined that the present system of intakes, pipelines, and reservoirs will be sufficient to withstand droughts that last two years in the future, after completion of the Wanaque South Project, including Monksville Reservoir. That project is being built by purveyors, probably with the assistance of a loan from the State. There is also, a potential multiple purpose reservoir, the Longwood Valley Project, which is under investigation by the Corps of Engineers. This would be a continuous water supply and hydroelectric power project. I understand that Congress assisted in obtaining authorization for this study, and we appreciate it.

Also of interest in the water supply picture are the F.E. Walter and Pompton Reservoirs in the Delaware River Basin in Pennsylvania. They are Corps of Engineer reservoirs for flood control, which we are attempting to have modified to provide additional storage for low flow augmentation. Repayment of the

Federal costs will be required but I believe that we can arrange that, through a system of charges for Delaware River Basin water. Low flow augmentation, provided at New Jersey expense, will be needed in the next few years to meet our obligations under the so-called Good Faith Agreement. Otherwise, we would be required to deny any further water allocations in our part of the Delaware River Basin.

Looking beyond the year 2000, it will be necessary for New Jersey to find additional sources of water outside the borders of the State. There has long been consideration of obtaining water from the Hudson River. In fact the Northeast Water Supply Study suggested such a project. Development of such a Hudson River project compliments an objective of the New Jersey Water Supply Master Plan directed at maximum use of intra-state resources and infrastructure. Regional management, system interconnections, and stringent regulation of system safe yields will maximize use of existing infrastructure into the 21st century. Addition of water from a new major supply such as the Hudson could meet our needs for at least fifty years into the future.

In view of the length of time it takes to plan and build a major project, and the particular conditions of the Hudson River (as evidenced by the prolonged controversy on the Westway project), it is not too early to initiate formal planning. We understand that New York State would have a similar interest.

I would be remiss in not commenting especially on the work of the U.S. Geological Survey. We have a major program of hydrogeological studies underway, funded largely by the State under the 1981 Bond Act, and partly by Federal matching funds. These studies are of very great assistance to us. They provide technical assistance of a high order, in determining aquifer characteristics, and in modelling responses to foreseen changes due to economic development and modified withdrawals from wells. First priority has been given to the depleted and threatened aquifers of the coastal plains; but we expect the program to continue in some of the hardrock and buried valley areas. Many of New Jersey's deeper and more-productive aquifers, especially in the Coastal Plain, are relatively well studied. Continuing investigations of these aquifers focuses mainly on answering questions of local nature, such a closely defining a local clay bed that serves to separate two aquifers or the interaction between two aquifers in response to pumping a public-supply well. It is now time to answer some of the more difficult questions regarding ground-water supply and hydrogeology.

Many questions regarding ground-water supply, ground-water contamination, movement of contaminants and surface-water/ground-water interaction concern the uppermost, or water-table aquifer. New Jersey would be very supportive of a program to define the water-table aquifer in the State as the first step towards answering some of these questions.

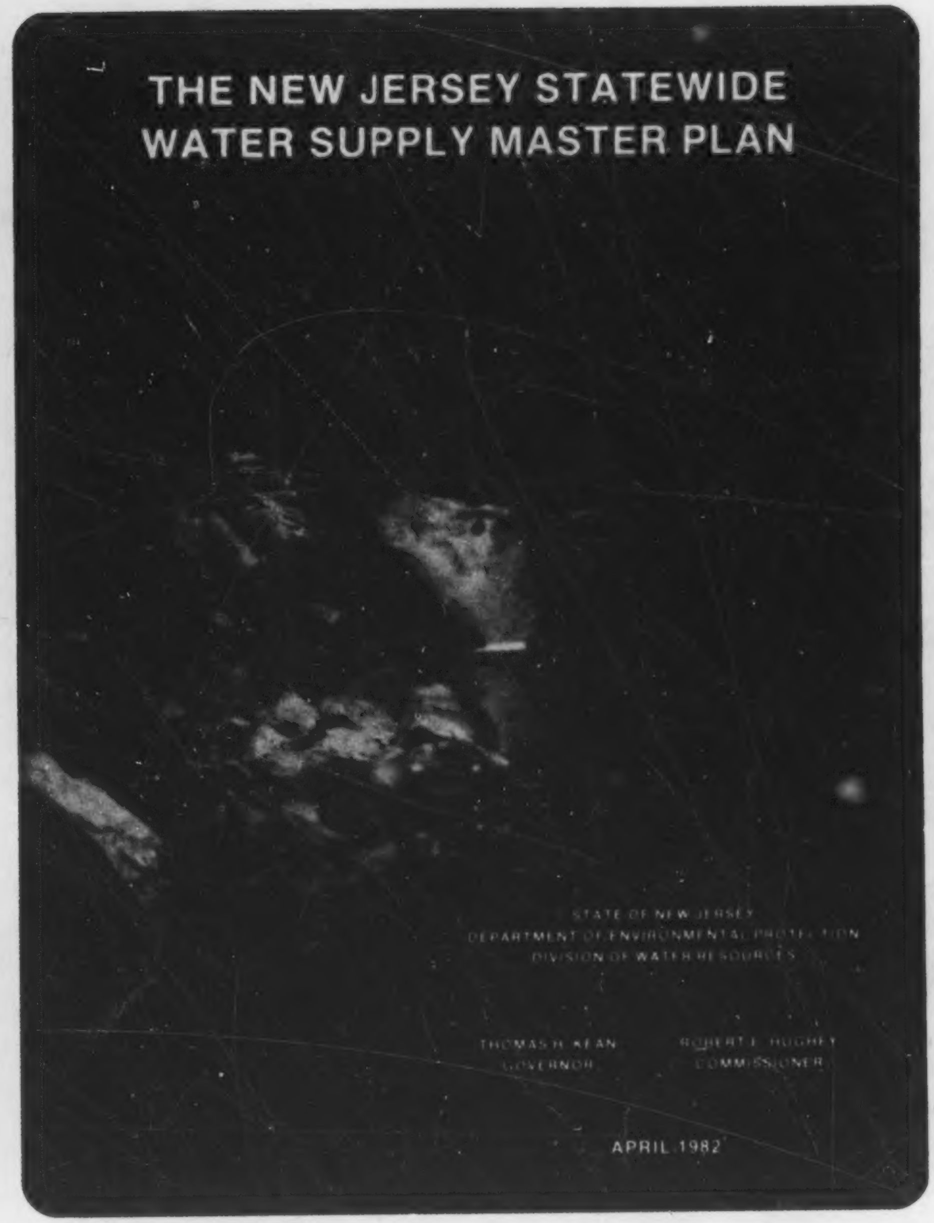
As part of this program, the establishment of a Drought Monitoring Network would be invaluable in aiding us to assess the severity and geographical distribution of future drought conditions. Both these projects should and will be implemented cooperatively with U.S.G.S. Cooperation from this service so far has been outstanding.

One last field of possible Federal assistance is engineering and planning from the Corps of Engineers for water system infrastructure improvements. New Jersey has adopted strict requirements under its Water supply Management Act Rules (N.J.A.C. 7:19-6 et seq.) covering system rehabilitation and management. Purveyors are required to submit and implement programs for the rehabilitation and long-term maintenance of their systems. this is an important regulatory requirement, given the fact that many water systems face large deferred maintenance costs. Assistance from the ACOE to organize and manage the development of a framework for these mandated technical infrastructure studies would be of great value.

New Jersey has taken the initiative to plan and manage its water supplies in a forward looking fashion. Our Master Plan represents a game plan, and our recent progress report shows that we are on target for the foreseeable future. Our program anticipates a complementary federal presence to accomplish some of the activities described above. We hope our presentation today will contribute to assisting you in achieving this goal.

Attachments:

1. New Jersey Water Supply Master Plan, April 1982
2. Update, 1983
3. Improvements, 1985
4. Critical Areas Package, 1985



# THE NEW JERSEY STATEWIDE WATER SUPPLY MASTER PLAN

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

THOMAS H. KEAN
GOVERNOR

ROBERT E. HUGHEY
COMMISSIONER

APRIL 1982

**STATE OF NEW JERSEY**
**DEPARTMENT OF ENVIRONMENTAL PROTECTION**
***ROBERT E. HUGHEY, COMMISSIONER***
CN 402
TRENTON, N.J. 08625
609 - 292 - 2885

May, 1982

Dear Citizen:

Attached is a copy of the completed New Jersey Statewide Water Supply Master Plan. This document, after thorough public review and release late last year, has now received final approval from the State Water Supply Advisory Council.

Although I note that the plan is now official, it is also stated in the plan that it is our intention to do annual updates and a complete five-year review of the document. This is a recognition of the expected changes in strategies that will result from feasibility studies undertaken and new ideas developed as we proceed to implement a sound water supply management program for the state.

Sincerely,

Robert E. Hughey

Robert E. Hughey
Commissioner

Attachment

## TABLE OF CONTENTS

PAGE

Letter from the Commissioner....................i

Table of Contents....................iii

List of Tables, Figures, & Appendices....................iv

Introduction....................v

I. Existing Conditions

A. Technical....................1
  Regional Water Supply, Demand & Needs....................1
  Regional Projected Needs....................10
  Water Resources of the State....................11
    Interstate Rivers....................11
    Intrastate Rivers....................12
    Groundwater....................13
  Present System Capabilities....................15
    Interconnections....................15
    Drought Response....................16
    Emergency Response (other than drought)....................16
    Yield and Low Flow....................17
    Planning Information and Data Management....................17
    Water Quality....................18
    Conservation....................21

B. Governmental....................22
    State Role and Responsibility....................22
    Purveyor Network....................25
    Water Law....................26
    Conclusions....................27

II. Plan of Action

A. Basis for Action: A Strategy....................28
B. Technical Recommendation....................33
  Immediate Actions....................34
  Regional Actions....................35
  Groundwater Studies in Key Areas....................48
  Procedures For Water Supply Project Selection....................52
  Actions in All Regions....................53
    Interconnections....................54
    Drought Response Plans....................54
    Emergency Response Plans....................55
    Yield and Low Flow Analysis....................56
    Planning Information Storage & Update....................57
    Repayment....................58
    Watershed and Aquifer Protection....................62
    Conservation....................65
    Special Water Treatment Problems....................70
  Actions Between 1985-2020....................72

PAGE

C. Governmental Proposals and Recommendations..............74
State Proposed Actions.................................85
Water Resources Management Act.........................83
Small Water Companies..................................87
State Water Supply Facilities..........................87
Accountability for all Water Systems...................88
Public Involvement in Water Planning...................89

List of Tables

1. Comparison of Population Data in Statewide Water Supply Master Plan to Preliminary 1980 Census Figures........2
2. Projected Additional Needs by Region.........................10
3. Classification of Point and Non-Point Pollution Sources......20
4. Capital Costs of Alternative to Increase Safe Yield In Passaic River Basin..................................37
5. Comparison of Operation and Maintenance ~~Costs -~~ Raritan-Passaic Pipeline and Monksville Reservoir..................38
6. Action Program (1981-85) Estimated Construction Costs........71

List of Figures

1. Water Supply Planning Regions..............................4

2. DWR Organization Chart.....................................24

3. Wanaque South..............................................39

4. Raritan-Passaic Pipeline...................................40

5. Manasquan Reservoir Project................................44

Appendices

Appendix 1 - Economic Comparison of Monksville Project with the Raritan Passaic Diversion...........................91
Appendix 2 - Water Supply Legislation (1981) .....................92
Appendix 3 - List of Public Participation Committee Members.......132
Appendix 4 - Source Data..........................................134
Appendix 5 - List of Libraries - Repositories for Master Plan Reports....................................136

## INTRODUCTION

> "The severe drought of the 1960's, culminating a long history of water problems, caused a serious crisis in New Jersey and finally focused governmental and public concern on the need for an adequate and reliable water supply. The drought lowered groundwater levels and brought reservoirs throughout the Northeast to critically low levels...and the State experienced considerable economic and social distress..."*

Although they had no way of knowing that New Jersey was approaching another equally serious water crisis, the work conducted by the State's water supply consultants predicted a critical situation if a significant water shortage reoccurred. It took only months to prove them correct.

Immediately after the drought of the 1960's, there were two major planning efforts initiated to address, in part, New Jersey's water supply problems - the North Atlantic Regional Water Resources Study (NARS) and the Northeastern U.S. Water Supply Study (NEWS). Among other findings, both of the studies identified northern New Jersey as an area in critical need of water supply improvements.

Acknowledging these findings and recognizing the potential complications to New Jersey of a water supply system so easily strained by below average precipitation, the State's County and Municipal Government Study Commission and the Governor's Interdepartmental Committee on State Water Supply Needs both recommended that the State develop and implement a comprehensive Statewide Water Supply Master Plan, which clearly defines New Jersey's water supply problems and the issues surrounding them.

The preparation of this plan was authorized by the Governor in late 1975. After development of the Plan of Study and Scope of Service, work on the Water Supply Plan began in December 1976. An association consisting of five consulting firms was selected to prepare the technical reports and recommendations for the plan. The Association consisted of these five firms:

- Havens & Emerson, Ltd.
- Parsons, Brinkerhoff, Quade and Douglas, Inc.
- Westwater and Gaston, Inc.
- Geraghty and Miller, Inc.
- Water Resources Engineers

---

*Summary of Consultants' Findings for the New Jersey Water Supply Plan, a report to the New Jersey Department of Environmental Protection, June 1980 for New Jersey's Statewide Water Supply Plan.

In addition, the Association secured the services of an Expert Advisory Council of acclaimed water supply experts to provide an additional critique of the various work elements. The State initiated an extensive public participation and intergovernmental coordination program. The State also secured the services of two special consultants to provide an additional technical review.

Over a period of 3½ years, the Association provided the DEP with the individual components of this Plan. Each component, termed "subtask" (see Appendix 4 for list of subtasks) was reviewed by the State staff and the public; received specific attention at a series of public meetings throughout the State; was revised by the consultants based on those reviews; and, eventually, was resubmitted to the State as the final input and recommendations of the consultants. These documents represent the work and the recommendations of the Association.

With the urgency of the current water shortage, the State was in a position to utilize the consultants' recommendations and the urgency of the water crisis to prepare and submit for legislative approval a package of bills designed to improve our ability to manage water supply resources in New Jersey.

In order to assure that the emergency legislation was an accurate response to New Jersey's water supply needs, the Joint Legislative Committee (Senate Committee on Energy and the Environment and the Assembly Committee of Energy and Natural Resources) held an extensive series of public meetings throughout the State. The recommendations in this plan represent the consultants' recommendations; the State's initial position and desired actions; all refined by further State planning and additional public input through the legislative hearing process. (Note: There are portions of the State's recommended action which differ from the consultants' recommendations. The reasoning behind these changes are discussed in detail in this plan.)

Following a format similar to the "Summary of Consultants' Findings", this plan assesses existing conditions in relation to supply availability and governmental arrangements for water supply management. This is followed by a discussion of the strategy the State will pursue in its water supply programs.

The strategy will include our management goals and details of the steps we intend to take now and in the immediate future to meet those goals. There will be an annual reassessment of our success and, as necessary, a redirection of our programs. Every five years, we will take an even more detailed look at our progress and determine the next set of activities needed to realize our year 2000 goals and beyond.

As the consultants have said, "The demands of the future will require an increased effort on the part of the public and private sector to address the technical and governmental issues that confront the State in the water supply field."

This document lays a framework for sound water supply planning designed to clearly identify responsibility, needs and resource capability and to develop the tools essential to meet those responsibilities, to satisfy the needs in a total acknowledgement of the resource capability.

The plan for action recommended in this report is contingent upon passage of the 1981 Water Supply Bond Act. If this act should not be passed, the availability of funds to carry out the planned programs would be seriously curtailed.

# EXISTING CONDITIONS

## I. EXISTING CONDITIONS

### A. EXISTING TECHNICAL CONDITIONS

New Jersey's water supply system is diverse and interrelated. More than 500 purveyors, both public and private, operate within the State. Approximately 75% of the water supplied by these systems is the responsibility of the twenty-five largest purveyors. Additional water is also developed by State agencies and a number of self-supplied users. Both surface water and groundwater resources are used extensively in the State, with groundwater supplies comprising some 40% of the total quantity of water distributed by public purveyors (1975 data).

The sources of water for the various purveyors in the State take many forms: reservoirs, river intakes, well systems, purchases from others, and combinations of these. The southern portion of the State relies predominantly on groundwater, while much of the northern area is dependent upon surface waters. In the densely populated northeast, a complex but inadequate network of interconnections exists for transfer of supplies. While many of these are used continuously, many others are untested and seldom if ever used.

The technical considerations which define the existing capabilities of the State's water supply systems and which provide a focus for future planning are described below.

### REGIONAL WATER SUPPLY, DEMAND AND NEEDS

The estimated demands for purveyor-supplied water in the various regions throughout the State were originally prepared in 1977 by the State's consultants using 1975 as a base year for employment and population statistics. Compilation of these 1975 demand estimates along with the reported 1976 withdrawals and diversions in the purveyor questionnaires, provided a sufficient basis to estimate future purveyor demand figures for the period of 1980 through 2020. Subsequent to the completion of the initial report, the Governor's Office of Policy and Planning published a set of county population projections for the period of 1980 through 2000 with the express purpose of coordinating State planning activities. The Division of Water Resources (DWR) updated the consultants' water demand projections in response to this action and directed the consultants to utilize the revised figures in their analysis of water supply deficits, and the need for future projects to fulfill these deficits. An examination of preliminary census counts clearly illustrates significant similarity with the State's projections where there was an average difference of only 4.5% between the census counts and the projected populations in sixteen of the State's twenty-one counties. The attached table lists both sets of numbers and shows the differences noted for each county.

Table 1.

Comparison of Population Data in Statewide Water Supply Plan to Preliminary 1980 Census Figures

| | 1970 Population | Preliminary 1980 Census Figures (a) | Forecasted Population (b) | Numerical Difference (a-b) | Percentage Difference |
|---|---|---|---|---|---|
| Bergen | 897,148 | 844,248 . | 865,700 | 21,452 | 2.5 |
| Hudson | 607,839 | 555,478 . | 584,100 | 28,622 | 5.2 |
| Essex | 932,526 | 848,969 . | 881,600 | 32,631 | 3.8 |
| Union | 543,116 | 502,464 . | 520,500 | 18,036 | 3.6 |
| Passaic | 460,782 | 447,698 . | 448,300 | 602 | 0.1 |
| Morris | 383,454 | 407,707 | 420,000 | 12,293 | 3.0 |
| Somerset | 198,372 | 201,771 | 218,900 | 17,129 | 8.5 |
| Middlesex | 583,813 | 594,984 | 602,000 | 7,016 | 1.2 |
| Monmouth | 461,849 | 496,313 | 517,100 | 20,787 | 4.2 |
| Sussex | 77,528 | 116,118 | 117,000 | 882 | 0.8 |
| Warren | 73,960 | 83,969 | 85,000 | 1,031 | 1.2 |
| Hunterdon | 69,718 | 87,093 | 84,000 | -3,093* | -3.6 |
| Mercer | 304,116 | 305,596 | 348,641 | 43,045 | 14.1 |
| Burlington | 323,132 | 360,824 | 379,024 | 18,200 | 5.0 |
| Camden | 456,291 | 471,009 | 526,617 | 55,608 | 11.8 |
| Gloucester | 172,681 | 199,378 | 217,193 | 17,815 | 8.9 |
| Salem | 60,346 | 64,579 | 62,700 | -1,879* | -2.9 |
| Cumberland | 121,374 | 132,278 | 138,800 | 6,522 | 4.9 |
| Ocean | 208,470 | 343,948 | 360,800 | 16,852 | 4.9 |
| Atlantic | 175,043 | 189,316 | 209,500 | 20,184 | 10.7 |
| Cape May | 59,554 | 82,069 | 86,200 | 4,132 | 5.0 |
| Total | 7,171,112 | 7,335,809 | 7,673,675 | 337,886 | 4.6** |

. indicates population down from 1970 Census

* indicates State projections lower then preliminary 1980 Census Data.

** Statewide percentage difference between 1980 census and forecasted total population.

Statistically, the State considers it unnecessary to undertake an immediate revision of the projections developed by the Governor's Office of Policy and Planning although tracking of the official county population estimates should be made on an annual basis. Consequently, it appears unnecessary to undertake an immediate revision of this plan's water demand forecasts. However, DEP should, on an ongoing basis, monitor residential and industrial water use to refine and enhance water demand estimates in coordination with county and regional planning agencies and local utility agencies.

Demand for purveyor-supplied water in 1976 was 1,047 million gallons a day (mgd). Since 1976, new source development has proceeded at a slow pace, generally on a local level, to replace or augment existing supplies. Demand for water, however, has steadily increased, reaching an estimated 1,080 mgd in 1980.

Although a direct comparison of resources and demands indicates that the State enjoys a moderate surplus of water, closer examination shows this is misleading. In the coastal communities of central and southern New Jersey, for example, summer vacationers inflate normal populations tenfold in some cases and much of the apparent surplus supplies in those areas is committed to meet these seasonal demands. Some surplus is desirable within a purveyor system as back-up supply in the event of emergency or drought. Committing these supplies to other demand areas could jeopardize response capability.

Some areas are in fact in the enviable position of having sufficient resources both for the present and the near-term future, while other areas are now in or are rapidly approaching critical shortage conditions. The particular status of water supply capabilities in each region is discussed below. For water supply planning purposes, the State has been divided into six regions, generally delineated by major river basin watershed boundaries. As outlined on the State map, Figure 1, these regions encompass the following portions of the State:

| | |
|---|---|
| Region 1 | Northeastern New Jersey (Bergen, Hudson, Essex, Union, Somerset, Middlesex and parts of Passaic, Morris, Sussex, Hunterdon, Mercer and Monmouth Counties) |
| Region 2 | Monmouth and Ocean Counties |
| Region 3 | Atlantic and Cape May Counties |
| Region 4 | Cumberland and Salem Counties |
| Region 5 | Burlington, Camden and Gloucester Counties |
| Region 6 | Northwestern New Jersey (Warren and parts of Passaic, Sussex, Morris, Hunterdon and Mercer Counties) |

Region 1 (Northeastern New Jersey)

The three major watersheds in this region are the Hackensack, Passaic and Raritan River Basins. Together they form an intricate and interrelated water supply network that serves a signficiant portion of the State's population. Along with the watersheds,

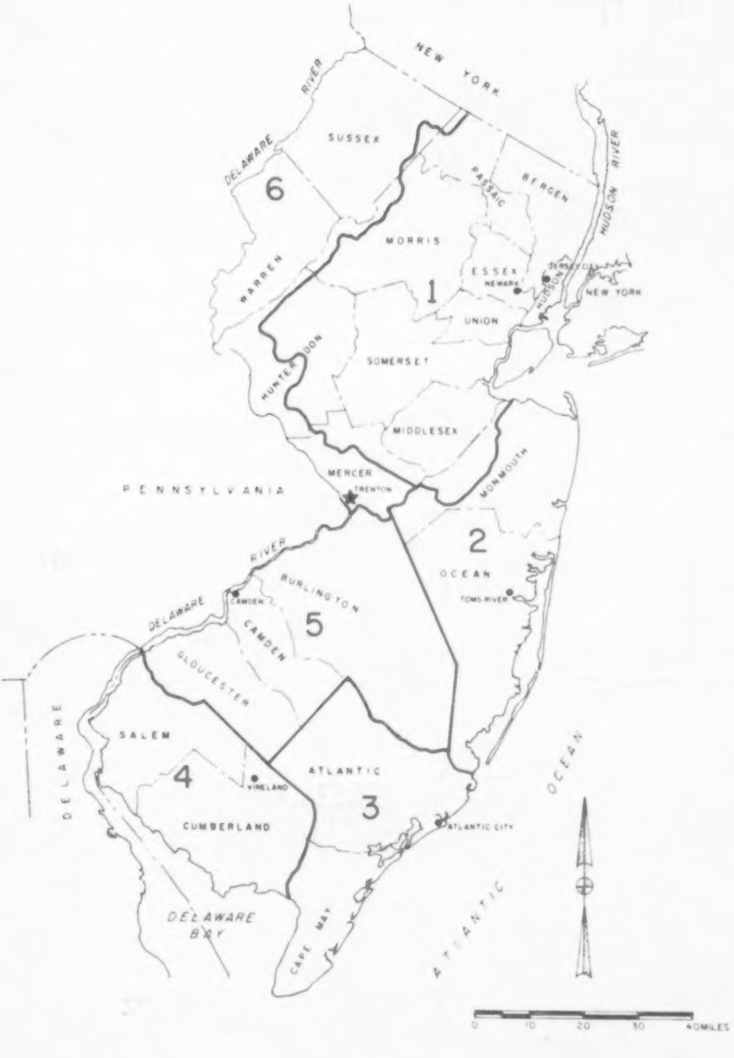

NEW YORK
DELAWARE RIVER
SUSSEX
6
PASSAIC
BERGEN
HUDSON RIVER
MORRIS
WARREN
ESSEX
NEWARK
JERSEY CITY
HUDSON
NEW YORK
1
UNION
SOMERSET
HUNTERDON
MIDDLESEX
MONMOUTH
MERCER
TRENTON
PENNSYLVANIA
2
OCEAN
TOMS RIVER
DELAWARE RIVER
CAMDEN
BURLINGTON
5
CAMDEN
GLOUCESTER
DELAWARE
SALEM
4
VINELAND
ATLANTIC
3
ATLANTIC CITY
CUMBERLAND
OCEAN
ATLANTIC
DELAWARE BAY
CAPE MAY
0
10
20
30
40 MILES

FIGURE 1

STATE OF NEW JERSEY

WATER SUPPLY
PLANNING REGIONS

N. J. STATEWIDE WATER SUPPLY MASTER PLAN the region is also served by the Delaware and Raritan Canal which has the Delaware River as its source. This adds to the complexity of the existing arrangement. New Jersey is authorized through a 1954 Supreme Court Decree to divert up to 100 mgd through the canal. The diversion is significant in that this water is removed (exported) from the Delaware Basin. (The ramifications of this Decree are discussed under Regions 5 and 6.)

Most of the water supply deficits that exist in this region are located in the Passaic and Hackensack Basins. The Raritan Basin on the other hand has an existing surplus of water. Most of this surplus water is located at the State owned Round Valley - Spruce Run Reservoir System. Unfortunately, limited means exist to transport this surplus to the other areas of need within the region.

In 1976, demands in Region 1 totaled 756 mgd. A unique condition exists in this region, since some purveyors are operating with supply surpluses and others are overdrafting their resources well beyond safe levels. By 1976, several water utilities had demands that considerably exceeded their safe yield.

In the water demand forecasts made by the consultants and later revised by the State, the analysis of supply limitations estimated that the 55 mgd deficit which existed in 1976, combined with the increased demands projected by the consultants for 1980, pointed to a deficit of 63 mgd increasing to 107 mgd by 1990. The present drought highlights this region's deficiency and the critical need for immediate action to transfer available surplus supplies existing in some purveyor systems to those with deficits until major new supply projects become operational. For several reasons which are discussed in the following section, DEP must study the causes and impacts of this drought in greater detail.

The consultants had verified, by their survey of the State's purveyors, that a considerable amount of funds is necessary throughout the State for rehabilitation of antiquated and leaky water supply systems. This is especially true in Region 1 due to the extensiveness and the age of water supply distribution systems. Average figures show 20-25% "unaccounted for" water in the older systems. While some systems have been well-metered and properly maintained there are other communities that have "unaccounted for" rates as high as 40%.

Examination of the existing technical conditions shows that DEP should concentrate its efforts on assuring construction of the purveyor sponsored Wanaque South Project; on reducing system losses, on repairing and constructing interconnections, and on evaluating the feasibility of new inbasin projects; and by conveying surplus waters in the Raritan River Basin to the areas of need in the Passaic and Hackensack River Basins. Some projects must proceed on an emergency basis if the drought persists into the summer and fall of 1981.

Region 2 (Monmouth and Ocean Counties)

Demands in 1976 totaled 79 mgd in this region, and 1980 demands are estimated at 92 mgd. The surpluses which exist are generally committed to peaking conditions, particularly within the coastal communities of Ocean and southern Monmouth Counties. The major portion of the region's surpluses are located in these areas, which are served predominantly by groundwater resources. Surface water supplies and groundwater systems in the area of Monmouth and northern Ocean Counties are experiencing development stresses. There is a need in this area of an additional 12 mgd in 1980. Although supply conditions are not presently at the critical point, potential loss of some existing supplies from saltwater intrusion due to overdrafting would seriously impact the area. The development of at least an additional 12 mgd should be given immediate attention.

This region realized a phenomenal growth rate during the 1970-1980 decade which added to the problem of overdrafting groundwater supplies. Such development has also contributed to the contamination of local potable wells where mismanagement, poor planning and insufficient regulations have allowed contamination of shallow aquifers.

Region 3 (Atlantic and Cape May Counties)

Demands for water in this region totaled 28 mgd in 1976 and are estimated to be 33 mgd in 1980. Seasonal population changes are significant in this region, particularly in the Atlantic City and Cape May areas, and apparent surpluses are, to large degree, committed to meet peak demands of the summer populations. While excess capacity is still available on a local basis and the 5 mgd increase in demand from 1976 to 1980 is not considered large enough to require any major project development, the impact of resort-induced growth, particularly in the Atlantic City portion of this region, must be carefully observed.

Increased tourist activities, due in part to casino development, have increased Atlantic City's water use by more than 30% since 1976, while also adding to the high points of peak summer demands. This increased demand could result in problems such as subsidence and loss of supply due to saltwater intrusion. The well fields that regularly supply Atlantic City are also threatened by contamination from a local landfill that is apparently leaching various pollutants to the groundwater aquifer. Protection of such potable water supplies, along with the containment or elimination of the contaminant source, is of primary concern to the State. Unfortunately, such problems raise jurisdictional, liability and other questions that often prevent immediate remedial action. DEP must find the resources to eliminate these and other similar delays in order to deal with the problems associated with the ever-increasing numbers of groundwater contamination cases.

Region 4 (Cumberland and Salem Counties)

The 1976 demand of 21 mgd in this region has not increased to any appreciable degree in 1980. Sufficient supplies are available to meet all existing 1980 needs. The abundance of groundwater resources, both developed and undeveloped, in the region provides for water supply stability. In some areas, surface water is also a viable resource. There is no immediate concern for additional supply development for Region 4.

Region 5 (Burlington, Camden and Gloucester Counties) and
Region 6 (Northwestern New Jersey)*

These two planning regions cover most of New Jersey's portion of the Delaware River Basin and pose the State with a unique management problem. This interstate river basin is shared by the states of New Jersey, New York, Pennsylvania and Delaware in addition to New York City which has major rights for its use.

New Jersey is responsible for administering a number of programs to manage the basin's water and other resources, but has shared certain responsibilities with the other basin states through the Delaware River Basin Commission (DRBC) formed by an Interstate Compact. DRBC was created in 1961 and is composed of the governors of each member state and an appointee of the President of the United States.

Since 1962 a Comprehensive Plan has been maintained by the DRBC which includes thirteen reservoir proposals. Two of the reservoirs, Beltsville and Blue Marsh, were built in Pennsylvania; but most of the others have met with increasing opposition in recent years.

In realizing the major policy issues that have also arisen in the last several years, the Commission recognized the need to reassess its Comprehensive Plan and consequently initiated its Delaware River Basin Comprehensive Study (Level B Study) in late 1976.

In addition to the Level B activities, New Jersey is also engaged in "Good Faith Negotiations". These discussions have resulted from the threat of legal action by the State of Pennsylvania due to DRBC actions relative to the 1954 Supreme Court Decree. The negotiations are directed at reassessing the apportionment of Delaware River water. New Jersey is currently entitled to export 100 mgd from the basin for use outside the Delaware Basin. The Delaware and Raritan Canal is the facility used for the conveyance of this water to Central Jersey.

New York City is also a major exporter of water from the basin with a Supreme Court allocation of 800 mgd. This water is stored in the City's upstream reservoirs and transported by aqueduct to points out of the basin.

---

* In the consultants' "Summary of Findings" these regions were addressed separately. In this document, the Delaware Basin is addressed together and in greater detail than in the consultants report due to the additional information available from the DRBC's Level B Study.

DRBC and DEP, through their respective planning programs, have identified a number of serious problems related to water quality and water supply management in the basin. The major surface water supply problems are:

1. poor water quality in the river
2. long-term water supply demands
3. increasing depletive uses (such as cooling water taken from the river but never returned to any downstream point)
4. basin exports by New York City and New Jersey
5. maintaining minimum river flow levels.

All of the above problems are interrelated and are also linked to several of the major groundwater problems in the basin which are:

1. overpumping of aquifer systems
2. groundwater/surface water interface and the increased potential for contamination
3. saltwater intrusion
4. local site contamination
5. data deficiencies

In Region 5, a tri-county area which includes Burlington, Camden and Gloucester Counties, water demands have been met, under most circumstances, with only a few complications to date. The region is entirely dependent upon groundwater for potable water supplies with the Potomac-Raritan-Magothy Aquifer providing 81% (146 mgd) of the region's total groundwater withdrawals in 1976.

Contamination problems have arisen in Region 5 from diverse sources which include industrial and landfill activities and the river water movement into this aquifer. Several water quality and solid waste management programs are addressing the first two problems to some degree and DEP, with the assistance of local government agencies, must continue to support the protection of the area's water resources from such problems in its water resource planning efforts.

As previously mentioned, the region has experienced groundwater problems which directly relate to the problems in the river. The aquifer at one time added water to the flow of the river but this condition has now reversed. The extensive development of groundwater supplies over recent years has lowered groundwater levels by as much as sixty feet in some areas. Estimates by the Army Corps of Engineers based on USGS studies have indicated that approximately 50% of the water withdrawn from this groundwater system is actually induced infiltration from the Delaware River. By the year 2000, this amount could increase to nearly 70% based on projected needs.

This situation becomes alarming in that a number of contaminants in the river may move toward the wells and affect potable water supplies. Low flows in the river work to concentrate the pollution thus aggravating the problem. Since groundwater normally receives less treatment, low pollution levels are more harmful than in surface water.

The surface water system in the New Jersey portion of the Delaware River Basin is a tidal estuary as far north as Trenton. The effects of tidal flows can cause water to be carried from 6 to 8 miles up and downstream of a given point, thereby affecting the location and movement of the saltwater interface and various discharge dispersions.

The presence of a saltwater front poses a continuing potential threat to those who depend on a supply of fresh water from the lower basin. During normal hydrologic periods, the flow is maintained at a level sufficient to stabilize the saltwater interface at a point no further north than the river's confluence with the Schuykill River (river mile 92). But during the drought of the early 1960's, the low flow periods permitted the saltwater front to move north another ten miles, just beyond the Cooper River, in the vicinity of Camden (river mile 102). It is therefore critical to sustain this interface below the Ben Franklin Bridge (river mile 98) in order to protect the aquifer from salt-water intrusion. The problem is even more severe during a drought when upstream reservoirs are hard pressed to release water for downstream purposes. The region would lose this invaluable and irreplaceable source of water should it ever become contaminated by saltwater.

Not only are demands increasing on the groundwater supplies but some supplies are being lost while many more are threatened. Although the degree to which these existing supplies will be lost is not clear, it is estimated that the immediate additional need for water in the Camden area is on the order of 5 mgd, increasing to 15 mgd by 1990.

Region 6 is comprised of the Upper Delaware and Wallkill River Basins in New Jersey which includes all of Warren County, most of Sussex County and major portions of Hunterdon and Mercer Counties. Small areas of Morris and Passaic Counties are also located in the region.

The 1976 demands in the region totaled 56 mgd and increased to an estimated 60 mgd in 1980. The consultants have indicated that the purveyors in Region 6 have sufficient resources, either developed or readily accessible, to assimilate this increase. Problems do exist in the mainstem of the Delaware River due to low flow conditions which exacerbate the poor water quality situation.

New Jersey's diversion of up to 75 mgd which is removed from the basin through the D&R Canal adds to the flow maintenance problems. In addition, the Level B Study estimates that up to 150 mgd in depletive uses of Delaware River water occur in New Jersey alone. In order to maintain the State's current allocation of 100 mgd and to protect existing diversion and water uses within the basin, New Jersey must support some type of contribution to the river flows in light of the foregoing problems and the Good Faith Negotiations.

## REGIONAL PROJECTED NEEDS

The current drought situation dictates a reevaluation and comparison of its impact on our supplies relative to previous drought events and a verification of our supply capabilities. When this drought event has passed and the opportunity is provided to study its overall effect on the various regions' development, we may observe new and possibly even greater deficits which will highlight major purveyor supply limitations.

Any subsequent development must take these new observations into mind when reconsidering alternative water supply projects proposed to alleviate supply deficits.

The previous discussions summarize the existing supply and demand status of the various regions of New Jersey evaluated by the consultants prior to the current drought. As demands increase in the future, the need to develop additional supplies will intensify. The current State estimates of the regional need for water in 1980 and ten-year intervals to 2020 are shown in Table 2.

TABLE 2

PROJECTED NEEDS BY REGION (mgd)

| | 1976 | Existing and Projected Needs* | | | | | |
|---|---|---|---|---|---|---|---|
| Region | Demand | 1976 | 1980 | 1990 | 2000 | 2010 | 2020 |
| 1 | 756 | 55 | 63 | 107 | 151 | 186 | 203 |
| 2 | 79 | 0 | 12 | 30 | 38 | 44 | 50 |
| 3 | 28 | 0 | 5 | 16 | 17 | 20 | 22 |
| 4 | 21 | 0 | 0 | 2 | 5 | 7 | 9 |
| 5 | 107 | 0 | 5 | 15 | 26 | 33 | 36 |
| 6 | 56 | 0 | 4 | 11 | 18 | 23 | 27 |
| Total | 1047 | 55 | 89 | 181 | 255 | 313 | 347 |

*These needs are based on projections made in 1976 and do not reflect implementation of projects designed to meet these needs.

These needs essentially represent the supply requirements anticipated in the future, based on 1976 projections. Upward revisions could occur due to factors such as loss of available supplies, industrial growth or increased per capita use. In addition, these figures are based on the current drought of record and may need to be revised upward with the occurrence of a drought more severe than that of the sixties. These figures could be revised downward due to impacts of long term conservation programs, improvements to minimize unaccounted for water, interconnections, conjunctive use, recycling and reuse or any other demand reduction or supply augmentation effort. These factors are among the interrelated elements in determining New Jersey's water supply needs and must be carefully monitored as critical ingredients in future water supply planning.

## WATER RESOURCES OF THE STATE

Having discussed the need for additional supplies in the various regions of the State, this plan will now review the major resources available to satisfy those needs. The major developed and undeveloped sources of water are:

- Interstate rivers: the Hudson River, Delaware River, and Hackensack River.
- Intrastate surface waters, particularly those in the Raritan River and Passaic River Basins
- Groundwater from rock aquifers and glacial valley gravels in the northern part of the State and from unconsolidated aquifers of central and southern New Jersey.

### Interstate Rivers

The Hudson River might be used as a source of supply for northeastern New Jersey or to help meet needs in other parts of the State. However, due to the quality of river water along its border, New Jersey can only obtain potable Hudson River supply from a diversion point within New York State and would then need to implement the necessary measures to transport it to New Jersey users. New York statutes require New York's consent before water can be exported. Concurrent to the efforts in this work plan, New Jersey must closely monitor the Army Corps of Engineers continuing study of the proposed Hudson River Diversion Project.

The Delaware River is in a different category. New Jersey is riparian on the Delaware River and a partner in the Delaware River Basin Commission. Provided the rights of other riparian users are observed and subject to the requirements of the Delaware River Basin Compact, New Jersey users have rights to take water from the Delaware River for use within the basin. New Jersey's transfer of water outside of the basin, however, is currently limited to 100 mgd by the Supreme Court Decree of 1954. The State-owned Delaware-Raritan Canal is the normal means to transport this allotment although, at present, State-held contracts for this water is limited to 75 mgd. During the current drought, this allotment was reduced by the DRBC to 62 mgd. Hydraulically the canal can not safely transport all 100 mgd. Rutgers University is currently completing a study of canal improvements which are necessary to allow full utilization of the 100 mgd allotment.

Options for the Delaware River include large on-stream reservoir projects such as the Tocks Island Lake Project (TILP), providing advantages of economies of scale and the potential for multi-purpose uses, including water supply. This particular project has generated a great deal of interest in recent years and was examined by the consultants in their work efforts. They determined that although there were major advantages to the Tocks Island project, there are several reasons for not recommending the project at this time based upon the consultants' evaluation conducted for the State's water supply plan; the analysis prepared by DRBC's Level B Study; and the institutional and environmental impacts of the project.

Due to its characteristics in this region, this portion of the Delaware River has been declared a national wild and scenic river. If the Basin states decided to proceed with development of the Tocks Island Lake Project, this classification would have to be reversed. The project could require twenty (20) years lead time for reconsideration, planning, construction and implementation. While this is not an unusual amount of time for Federally-sponsored water resource projects, this lengthy procedure is totally unacceptable in terms of meeting immediate and interim water demands. Nevertheless, future consideration is absolutely necessary and a mainstem dam project on the Delaware River should be reexamined five years hence during the preparation of the next update of the Master Plan, as a viable option to meet water supply needs beyond the year 2000.

### Intrastate Waters

Except for utilization of Delaware River waters along the western border of the State and through the D&R Canal, and use of some New York supplies in the upstream Hackensack River system, intrastate resources, including rivers, natural and man-made reservoirs, and groundwaters, have been the principal sources of water supply in New Jersey and will continue to be so for many years. Details of groundwater supplies are discussed below. Dependence upon intrastate surface water supplies is particularly significant in the northern portions of the State, with twelve of the largest purveyors in Region 1 relying almost entirely on these resources, including the Raritan River, the Passaic River, Wanaque Reservoir, Boonton Reservoir, and the Round Valley/Spruce Run Reservoir system. Intrastate surface supplies, particularly in the Passaic River and Raritan River Basins, offer significant potential for further development. It is estimated that the surface supplies available in these basins, with proper development and management, are sufficient to meet needs in Region 1 until the turn of the century.

## Groundwater Resources

The State can be divided into three broad geographic areas: the Coastal Plain, the Triassic Lowlands, and the Highlands. Until 1980, it was almost impossible to determine total groundwater usage in these three areas since current regulations did not require the recording of all pumpage information and a great deal of groundwater usage was not metered. Groundwater diversions approved by the Water Policy and Supply Council (based on a daily average during the maximum month) totaled nearly 980 mgd in 1976, but total reported pumpage was only 500 mgd (based on annual records, exclusive of grandfather claims).

In addition to the approved diversions, many groundwater users were classified as having grandfather rights. In 1947, the Legislature passed the Diversion Control Law which required State permits for the development of new or increased groundwater supplies after a basin was designated as "protected" under the law. Groundwater users having wells prior to the designation of their respective areas had their diversions "grandfathered" and were allowed to use their existing wells at rates determined by the wells' pump capacity at that time. Neither a permit nor any records of use was required.

In 1976, total grandfather rights amounted to over 740 mgd. It had been impossible to determine the extent to which these rights were used. This situation was remedied in 1980 when the Governor signed into law modifications to N.J.S.A. 58:4A-1 et seq. (Law Relating to Diversions of Sub-Surface Waters for Private Use).

By this action, more than 200 of the original 666 holders of grandfather rights had been eliminated for reasons such as well abandonment, change of business ownership or property title, etc. The remaining users were required to apply for a permit and begin recording the extent of their groundwater use. Preliminary observations have shown that the utilization of the grandfather rights are substantially less than the original entitlements made in 1947, and DEP will have to assess this situation as part of its overall management strategy on groundwater availability.

The Coastal Plain physiographic province is the largest area and encompasses more than 5,000 square miles in the southern portion of the State. Five major aquifer systems, consisting of extensive beds of unconsolidated deposits, are capable of yielding large quantities of water. Estimated groundwater pumpage from the Coastal Plain aquifers is over 440 mgd and recharge to the aquifer has been estimated at approximately 5,000 mgd. The physical ability to withdraw groundwater from storage is not a limiting factor, except in areas where pumpage is causing saltwater encroachment, or where pumpage can lower the water levels in the aquifer and reduce streamflow. Only a small portion of the total supply capability of the Coastal Plain aquifer system has been utilized. Upon initial review, this appears to satisfy all foreseeable future needs for water in the area. Yet, further analysis shows significant constraints on the dependability and use of this supply due to impacts of pumping on streamflow, the severity of contamination from man's activities and the economic, environmental and institutional problems of transporting groundwater from undeveloped aquifer areas to water short localities.

Major aquifer systems in New Jersey have been shown to be vulnerable to contamination from many sources of groundwater pollution (leaks, spills, landfills, saltwater intrusion, etc.) Recently, the presence of organic chemicals in groundwater has resulted in the closure of many wells. In the past several years about 500 individual domestic wells were closed and approximately 9 mgd of public water supply capacity was lost because of groundwater pollution.

Loss of surface water supply under drought conditions represents an immediate catastrophe. With the resumption of normal precipitation, this situation is remedied. Loss of a groundwater supply by pollution represents a long term problem, as polluted groundwater takes tens to hundreds of years to clean up. In either case, without intervention, the end result is an inadequate water supply.

In the Triassic Lowlands and the Highlands Regions, most water-bearing zones are found in sedimentary and crystalline rocks which vary considerably in their ability to yield water to wells. Unconsolidated glacial deposits exist in both regions and represent the most important source of groundwater. Wells in the more permeable glacial deposits can sustain million-gallon per day yields. The areal extent of these glacial aquifers is relatively unknown except in the heavily developed areas of the region. However, in these developed areas, pumpage and consumptive use have overstressed aquifers and limited the availability of new supplies.

Any discussion of existing supplies of water is incomplete without a specific discussion of the availability of water underlying the coastal plan aquifers in the area known as New Jersey's Pinelands.

According to the State's water supply consultants, "...approximately 3.75 bgd* of groundwater is potentially available for development"[1] due to recharge of the aquifer systems. While this amount can only be considered a theoretical safe yield since groundwater supports the base flow of streams, further analysis shows that there are even larger amounts of water in storage within the Coastal Plain formations. The consultants believe that the amount of water in storage is on the order of 85 to 170 trillion gallons. The consultants caution that "this is only an indication of the ability of the various aquifers to store water, and it would never be feasible or desirable to remove a large percentage of this water because of the long-term effects on groundwater levels, well yields, streamflow, and in some areas, saltwater encroachment. However, it does indicate that there is much more water available from the Coastal Plain formations, at least over the short term, than an amount based on annual replenishment from percipitation."1

---

*billion gallons per day

[1] Source Material, Task VII, Watershed Management, Prepared by Consultants for the New Jersey Statewide Water Supply Master Plan, June 1980.

The same concerns exist about the use of these supplies as expressed previously in this report. Their vulnerability to contamination from surface activity, their relationship to surface water flows, and potential for saltwater encroachment due to overdrafting all present limitations on the use of this supply. Recent action by the legislature will further limit the use of the water in the Pinelands Preserve by prohibiting transport of the water more than ten miles beyond the region.

## PRESENT SYSTEM CAPABILITIES

The existing status of water supply in the State is further defined by such factors as transfer capabilities through interconnections, emergency and drought response capabilities, conservation activities, water quality considerations, yield and low flow determinations, and data handling capabilities. These factors are discussed below.

### Interconnections

Approximately 590 individual interconnections have been identified, ranging in size from major 48-inch pipe connections to temporary fire hose hook-ups. About 150 interconnections are in service for normal transfer of water on a regular basis, the remainder being intended for emergency supply transfers. In general, interconnections used for regular water transfer are well maintained, while those reserved for emergencies remain inactive for long periods and are often neglected. Little is known about the actual capacity of the emergency links or how they would function should an emergency arise. Testing is needed to confirm the conditions and capacities of many interconnections in order to realistically define rehabilitation needs. The importance of interconnections in the overall water supply program is unquestioned. In some cases, these links represent a purveyor's sole source of normal or emergency supply.

The current drought has illustrated the role of several key interconnections among major purveyors in need of emergency supplies. The highly important Elizabethtown-Newark interconnection is currently underway and will significantly improve the ability to handle future emergencies. Modifications and expansions to several existing interconnections will help provide additional supplies to the areas of need.

---

[1] Source Material, Task VII, Watershed Management, Prepared by Consultants for the New Jersey Statewide Water Supply Master Plan, June 1980.

## Drought Response

Historically, purveyors and State agencies have reacted to drought emergencies rather than having planned to prevent or minimize their impacts. As drought experiences recede into history, the lessons of the drought fade and are lost in the daily activities of business-as-usual. Since the major drought of the 1960's, nature has cooperated with the water supply industry until 1980 by providing the State with abundant rainfall. Increased demands and increased reservoir system withdrawals, without parallel development of new resources, have combined to reduce overall drought response capabilities. Drought response planning has been lacking and much of the State is again in the position of having to react to drought, rather than being prepared for and possibly preventing drought impacts. The need for drought response planning is therefore an immediate concern.

Governor Byrne, in his Drought Emergency Executive Order No.104 ordered all purveyors, municipalities and counties to prepare drought response plans to deal with such items as fire protection, health care facility operations, and curtailment of industrial activities. On a long term basis these plans will be detailed, refined and coordinated, possibly on a county basis, with technical assistance from a number of State agencies. Ultimate authority to approve the plans will rest with the State.

## Emergency Response (other than drought)

A drought is just one type of emergency that may impact on our water supply systems. In comparison to droughts, which are gradual, other emergencies can occur suddenly and require immediate action. System failures due to equipment malfunction, pipe breakage, or contamination have a serious and often immediate impact on the consumer. Water companies must be prepared to address these emergencies with everyone having a clear understanding of his specific responsibilities. Realizing the importance of this, the State of New Jersey presently has an EPA-approved Response Plan for Water Supply Emergencies, developed under requirements of the Safe Drinking Water Act. In addition, at the State's request, ten major purveyors developed individual emergency response plans for their own utilities. In general terms, the State's responsibility in these type of emergencies is one of providing technical assistance to purveyors, making available certain equipment and manpower, and providing overall coordination in the event the purveyor(s) cannot adequately respond. Despite efforts by the State and the purveyors, however, the present overall status of emergency response planning is weak. The large majority of purveyors did not have response plans prior to the drought. There is a definite need for purveyors to develop plans, with State guidance, which are responsive to their own systems' vulnerabilities and capabilities.

## Yield and Low Flow

Most purveyors assess the yield of their surface water facilities to establish a so called "dependable yield," the value of which depends on the method and data actually used. Traditionally, the State has relied on the "safe yield" concept based on the worst drought of record. This number changes as the worst drought of record changes. Acceptable, standardized procedures are needed for determining source yield capabilities which include consistent attention to the upstream and downstream inputs and withdrawals. There is also a need for consistent application of the results of yield analyses, particularly as they influence planning and development of facilities and operating strategies.

In this report, the "safe yield" of each purveyor's system, achievable without violation of mandated low flows, is used as a measure of the capability of the system. The difference between that safe yield and the excess demand for water for that purveyor's customers (including other municipalities supplied by contract) is referred to as a deficit.

The absence of any adopted safe yield figures for major purveyor systems has left the State without clear criteria on which to base a sound regulatory program to assure each purveyor's adequate supply. Since the State lacks the proper regulatory program to set diversion limits, several major water purveyors have overextended their facilities by supplying water in amounts significantly greater than their "dependable yields" would allow under stress conditions. These facilities operate with little or no supply problems when they receive above average levels of precipitation. However, the current drought has all too clearly illustrated the deficits that now exist in many systems and the problems which result from not maintaining adequate "safe yields".

In assessing the yield of a system, the volume which must be maintained downstream, or environmental low flow, is an important consideration. There has been no uniform procedure used for estimating minimum streamflow requirements except to relate releases to the size of the watershed. As water quality downstream becomes a controlling factor, a better approach to the relationships among low flow, yield and priorities is required.

## Planning Information and Data Management

There is considerable data relating to water supply in the files of the Department of Environmental Protection and other agencies. However, information is scattered among many different bureaus and divisions, severely affecting its usefulness. Frequently, the format used for the collection of this data also is developed for a specific application which may limit its usefulness in other areas. Water purveyors often complain of the time spent filling out long forms that may duplicate information already submitted to another bureau or division on a different form. In addition, these forms generally are not uniformly designed for computer use. There is an obvious need for centralization, computerization and preparation of data in a format suitable for more efficient use. In addition to problems related to format and accessibility of data, there is also a need to expand the data base in some areas. The absence of an adequate data base is particularly acute with regard to geologic and hydrologic information. While it is generally known that groundwater is renewed when rainfall is transmitted through surface outcrops of water bearing geologic deposits there is little known about the quantitative significance of this recharge to the replenishment of our groundwater resources.

The Department believes that the development of water budgets for the potable watersheds of the State represents an important important management tool on which to base future decisions that affect water supply demand. The HEC-5 computer model prepared by the consultants and used to calculate water budgets for five of the State's watersheds is an important step forward in improving our knowledge of water budgets.

### Water Quality

A large amount of effort and resources has been committed during the last ten years to improving the State's water quality. Programs for extensive water quality planning, facility planning, wastewater treatment plant financing and discharge permit programs have all been developed to move us closer to the goal of "fishable and swimmable" waters throughout the State. Surface water quality in our large rivers has improved in parts of the State yet serious problems continue to exist. These problems not only impact our ability to reach the "fishable and swimmable" goals but even more specifically, water quality problems cause major problems in our water supply efforts.

Use of surface water for potable purposes becomes increasingly more difficult, and more expensive, as those waters become more contaminated. It is not unusual in New Jersey to have a number of dischargers located upstream of a potable water supply intake. In such cases, it is difficult to treat this supply, which includes a large volume of industrial and municipal wastewater, to a satisfactory level for human consumption. Another relationship exists between surface water quality and supply which was made painfully evident during the current water crisis. Because of the limited precipitation, natural stream flows were low. Water supply demands on the reservoir systems made it prudent to reserve as much water as possible in the upstream reservoirs and reduce let-down requirements. This, coupled with the decreased runoff without a decrease in the wastewater discharges resulted in a lowering of the water quality in the river at the intake for several of the major water purveyors in the northeast. This decreased water quality resulted in one of the region's major purveyors being unable to treat the maximum flow through the system thereby further decreasing available potable supplies to the part of the State hit hardest by this water shortage. Moreover, the treatment of water of such degraded quality may leave highly undesirable residuals.

Water quality problems associated with groundwater are proving to be a much more prevelant problem. Groundwater has generally been considered safe and, in the past, only minimal treatment is ever provided for this supply which provides over one-half of New Jersey's water. In areas where municipal or private water companies have not provided this service individual wells are dug, again with only minimal treatment to remove impurities.

We have, over the years, moved steadily towards a crisis in our groundwater supplies. In contrast to surface water, the cleaning up of a polluted groundwater supply and returning it to potable use is far more difficult and costly. In addition to legitimate practices that have resulted in groundwater contamination, New Jersey is also plagued by a history of illegal dumping of domestic and hazardous waste. Sandy soils, such as those in southern New Jersey, allow for rapid percolation into the underground water system and therefore have been illegally used as receptacles of hazardous liquid wastes, often impairing enforcement efforts by leaving no trace on the surface. The rural areas which exist throughout New Jersey are often used as dumping sites by unscrupulous dumpers and individuals unaware of potential impacts. Each of these activities has the potential to seriously degrade the water quality and often render it useless as a potable source. Often the control of groundwater contamination through containment is all we can hope for, and these supplies must then be excluded completely from potable use. This exclusion is, for all practical purposes, forever. This abandonment of contaminated supplies, therefore, results in the need to discover another supply as replacement. As we learn more of the extent of groundwater contamination in New Jersey, the need to begin thinking and planning carefully to protect this supply becomes even more evident.

We are constantly becoming aware of new sites where earlier unregulated industrial and municipal waste disposal practices have resulted in serious groundwater contamination. Although we continue to expand our knowledge of groundwater systems and our awareness of potential impacts, the reality is that we have only limited information about our underground systems. The State, along with county and local governments, faces an immense problem in assessing and attempting an after-the-fact control and abatement of water contamination. To quote the consultants, "Development of plans for the use of either surface or groundwater resources will be impossible unless the water is available in the quality as well as quantity expected."

Sources of pollution affecting the quality of drinking water supplies have been characterized in the State's Water Quality Management Plans, as point source discharges and nonpoint source discharges. (Point sources of pollution are generally those emanating from a municipal or industrial treatment works and discharge to surface or groundwaters. Nonpoint sources are those associated with stormwater runoff, spills, or malfunctioning septic systems.) Both point and nonpoint sources of pollution occur throughout New Jersey and the serious deleterious effects of both have been observed extensively in both surface and groundwaters. The following list indicates some of the categories of point and nonpoint sources of pollution which are of concern in protecting surface and ground potable water supplies.

TABLE 3

CLASSIFICATION OF POINT AND NON-POINT POLLUTION SOURCES

| Point Sources | Nonpoint Sources |
|---|---|
| Municipal Waste Discharges | Urban/Suburban Runoff |
| Industrial Waste Discharges | Agricultural Runoff |
| Industrial Waste Discharges to Municipal Sewage Treatment Plant's | Construction Related Runoff |
| Certain Stormwater Discharges | Malfunctioning Septic Systems |
| Landfills | Silviculture Related Runoff |
| | Hydrographic Modifications |
| | Spills |
| | Saltwater Intrustion |
| | Mining Related Pollution |

Pollutants associated with these discharges can have and, indeed, have had a significant negative impact on the quality of the State's drinking water, whether it is sediment, nutrients, oxygen demanding materials and other conventional type pollutants or toxic, hazardous, and carcinogenic substances.

As stated earlier, water supplies seriously contaminated by these types of substances are being discovered routinely. At best, the discovery of contamination results in increased costs for water treatment while at worst, sources have been rendered useless resulting in the irretrievable loss of the precious resource.

Nearly all point and most nonpoint sources of pollution are a direct result of man's activities. The effects of uncoordinated land use and the introduction of incompatible human activities into areas serving as sources of potable water supply have created deteriorated water quality conditions which test the effectiveness of conventional, inexpensive water treatment systems. This has also resulted in serious imbalances in the water budget by creating competing demands on a water source. For instance, development is occurring in watershed areas which originally provided water to a distant service area thereby creating serious competition for the same water. The continuation of uncoordinated land use and the encroachment of incompatible activities into potable water supply source areas will only serve to exacerbate these already serious problems.

## Conservation

Water has traditionally been viewed as an inexpensive and unlimited resource -- and conservation efforts were implemented only on the "rare" occasions when water became scarce. However, the specific lessons of recent droughts and a new nationwide awareness of the limited nature and vulnerability of natural resources have focused more attention on water conservation and wise water use. In New Jersey, for example, the State Uniform Building Code (September 1979) was revised to require water conservation plumbing devices in all new construction. A few municipalities and water purveyors have begun programs to promote conservation, install and test water-saving devices, and conduct educational programs. These activities have been sporadic, however, and a great deal more effort is required, not only to encourage conservation, but to further understand its potential water-saving impacts and inspire an efficient use philosophy.

In this effort, we must realize that water conservation is complementary to energy conservation. For example, low flow showerheads not only save water, but they are also helpful in saving the energy that would have been used to heat that water.

The importance of water conservation is particularly apparent during the current drought. Many people in the impacted area have adjusted their water use practices, acknowledging the seriousness of the situation and the importance of their cooperation. Severe restrictions were placed on certain water uses and in the hardest hit areas, rationing, with substantial surcharges, was imposed. The combined efforts of industry, commercial establishments, private citizens, municipalities and purveyors resulted in an estimated savings of 13 billion gallons over the first 10 months of the drought.

In addition to these temporary behavioral techniques which require an adjustment to people's lifestyles, water conservation can be achieved through a variety of permanent structural water conservation techniques. These long term techniques include retrofit programs, improvements to collection and distribution systems, and low water use - drought resistent landscaping and industrial recycling and reuse.

## B. EXISTING GOVERNMENTAL CONDITIONS

It was the opinion of the plan's consultants that the State's approaches in regulating and managing water resources have not evolved at a rate commensurate with the development of problems and issues. Quoting the consultants' summary report, "The interrelationship among a number of State agencies and more than 500 purveyors requires sharing of responsibility and interdependence, which can be complicated by specific municipal, county, regional, and interstate problems. Recent Federal legislation, such as the Safe Drinking Water Act, is serving to force the State to assume a greater role in regulation and management, or else let these responsibilities pass to the Federal domain by default. Moreover, although responsibility for assuring an adequate and acceptable water supply for the present and foreseeable future rests at present with the purveyor, it is questionable whether all purveyors accept this responsiblity equally."

### State Role and Responsibility in Water Supply Management

The State has major responsibility for protecting the quality and quantity of the water resources of New Jersey. Although action of other State agencies may impact our water systems, primary responsibility rests with the Department of Environmental Protection (DEP).

Again, there are units within the DEP whose activities have direct and indirect impact on the water resources of the State but primary responsibility rest with the DEP's Division of Water Resources.

Figure 2 provides the most recent organizational chart for the Division of Water Resources. Principle water supply related activities and organizational units responsible for these activities are:

Water Supply and Watershed Management Administration

Bureau of Water Supply Planning & Allocation - long range planning, issuance of well drilling and water diversion permits, record keeping.

Bureau of Potable Water - potable water quality and service.

Water Facilities Operations Element - purveyors of water from Round Valley Spruce Run Reservoir and the Delaware and Raritan Canal

Water Quality Management Element

Bureau of Groundwater Resources Management - groundwater pollution studies residual management, input to groundwater discharge permits (NJPDES).

Other State organizations directly involved in water supply management from a pricing and financial perspective are the Board of Public Utilities (BPU) and the Department of Community Affairs. The BPU has responsibility for regulating rate setting, quality of service provided and other financial standards for all investor-owned water supply systems and for any system that sells water wholesale outside its distribution boundaries. The Department of Community Affairs receives and reviews financial information from municipally-operated utilities and publishes them in an annual report but has no regulatory authority over these systems. It became obvious as this study progressed that this type arrangement, wherein only some purveyors were required to establish and maintain sound management and fiscal organizations, resulted in many systems wherein the cost of water does not reflect the expenses incurred in providing that water. Financial arrangement, whereby the municipal water department does not receive back revenues generated in the treatment and distribution, often results in deteriorating or inadequate systems.

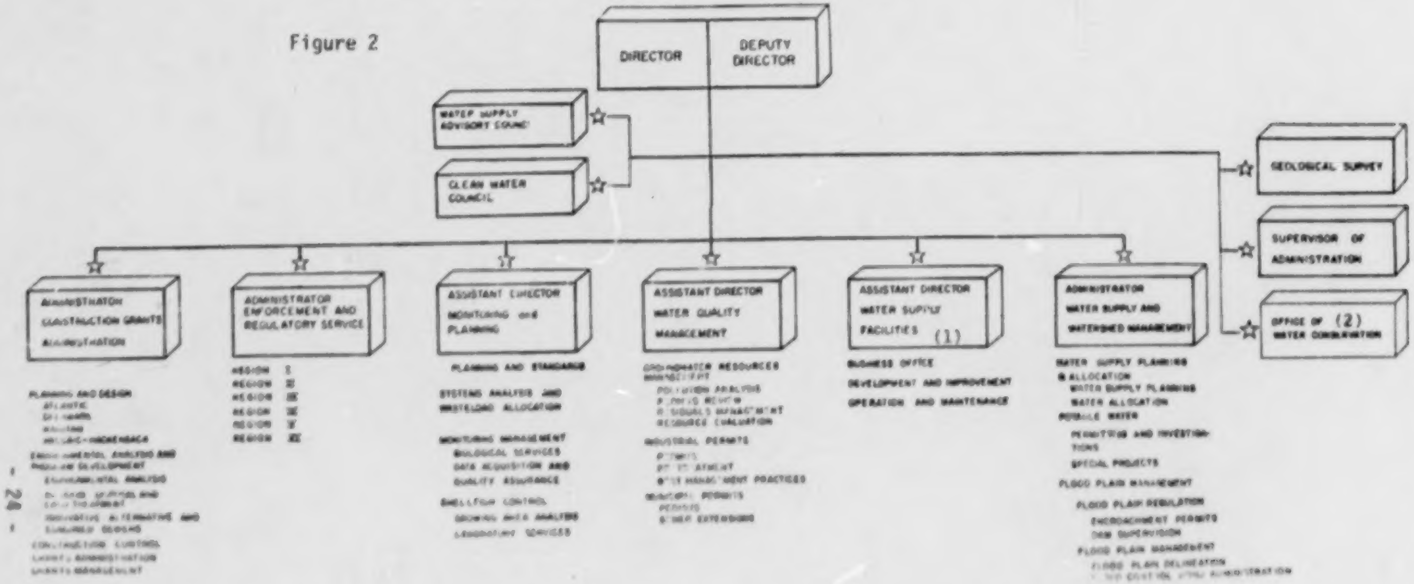
If the State, through its Bureau of Potable Water, examines such a system and finds it does not meet standards for quality or supply, the water department in the municipality is often unable to remedy the situation because the revenues generated by the water department are far too low to adequately support the system, or, the revenues were adequate, or high, but, through the general budget, they are used to finance other elements of the local government.

This problem of DEP orders going unanswered is not only a problem to the municipal systems. Since the private, investor-owned systems are permitted by law to realize a certain percentage profit to be reflected in rates approved by the BPU, most actions to address DEP orders result in requests for rate increases before the Board of Public Utilities. In the past, orders have gone unresolved due to problems associated with this rate review.

For the past 70 years the Water Policy and Supply Council has had the authority and responsibility to approve or deny all requests for water diversions greater than 100,000 gallons per day for all surface or groundwater in the State of New Jersey. In today's complex and technical environment, the Council was hard pressed to review and decide upon complex technical matters in a timely fashion, without extensive staff support and technical resources. Decisions on water supply requests were generally made on the ability of the applicant to show a need, verses the ability of an objector to prove a substantial potential negative impact. As demands on our water supplies are becoming more intense and as the determination of potential impacts become more complex and expensive, the appropriateness of a lay body of volunteers making all water supply allocations has come under critical question resulting in major legislative changes which are discussed later in this report.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Figure 2


DIRECTOR
DEPUTY DIRECTOR
WATER SUPPLY ADVISORY COUNCIL
CLEAN WATER COUNCIL
GEOLOGICAL SURVEY
SUPERVISOR OF ADMINISTRATION
OFFICE OF (2) WATER CONSERVATION
ADMINISTRATOR CONSTRUCTION GRANTS ADMINISTRATION
ADMINISTRATOR ENFORCEMENT AND REGULATORY SERVICE
ASSISTANT DIRECTOR MONITORING and PLANNING
ASSISTANT DIRECTOR WATER QUALITY MANAGEMENT
ASSISTANT DIRECTOR WATER SUPPLY FACILITIES (1)
ADMINISTRATOR WATER SUPPLY AND WATERSHED MANAGEMENT
PLANNING AND DESIGN
CONSTRUCTION CONTROL
GRANTS ADMINISTRATION
GRANTS MANAGEMENT
REGION I
REGION II
REGION III
REGION IV
REGION V
REGION VI
PLANNING AND STANDARDS
SYSTEMS ANALYSIS AND WASTELOAD ALLOCATION
MONITORING MANAGEMENT
BIOLOGICAL SERVICES
DATA ACQUISITION AND QUALITY ASSURANCE
SHELLFISH CONTROL
GROWING AREA ANALYSIS
LABORATORY SERVICES
GROUNDWATER RESOURCES MANAGEMENT
POLLUTION ANALYSIS
RESOURCE EVALUATION
INDUSTRIAL PERMITS
MUNICIPAL PERMITS
BUSINESS OFFICE
DEVELOPMENT AND IMPROVEMENT
OPERATION AND MAINTENANCE
WATER SUPPLY PLANNING & ALLOCATION
WATER SUPPLY PLANNING
WATER ALLOCATION
POTABLE WATER
PERMITTING AND INVESTIGATIONS
SPECIAL PROJECTS
FLOOD PLAIN MANAGEMENT
FLOOD PLAIN REGULATION
ENCROACHMENT PERMITS
DAM SUPERVISION
FLOOD PLAIN MANAGEMENT
FLOOD PLAIN DELINEATION

1. Upon adoption of Senate Bill 1612, responsibilities and personnel of this element will be transferred to the State Water Authority

2. New Office, created as a result of recommendations of this Plan.

To again quote the consultants, "...the interrelationships and potential interactions among these regulatory agencies are important. While the BPU has jurisdiction over rates, quality of service and financial matters, the DEP exercises jurisdiction over public health and safety matters. Engineering considerations and approvals for projects and improvements are under DEP, but all economic justification is with BPU, and financial review of municipally operated systems is with the Department of Community Affairs. The Water Policy and Supply Council holds hearings and approves new or additional supplies. Other matters affecting the quality of the raw water source are referred to the DEP Commissioner or Division Director for final decision.

Each of these agencies has partial, and sometimes overlapping, obligation and responsibility for water supply management. The need for coordination and communication among them is obvious, particularly as they oversee New Jersey's diverse purveyor network..."

## The Purveyor Network

New Jersey's water supply system is essentially composed of five major organizational types, or classes, of purveyors: the municipally operated system, the investor-owned system, the water commission, the authority, and the State-operated utility.

Of the municipally owned utilities, nearly all take advantage of existing legislation which permits a municipality to separate self-liquidating water utility obligations from its debt statement. This does not mean that municipal water utilities can operate with the same degree of management independence enjoyed by the investor-owned systems. In reality, with most major cities under financial stress, other municipal responsibilities frequently influence water utility decisions and expenditures. This often results in water revenues being "siphoned" off for other purposes, leaving insufficient funds to keep the system operating properly.

Investor-owned utilities fall into two groups: one representing the larger, established, well-managed and well-financed utilities; and the other representing the small utilities, many of which are under-managed, under-operated and under-financed. The larger investor-owned utility represents a major contribution to good water service in New Jersey. These utilities are among the best operated and maintained in the State.

Small investor-owned utilities, however, are a serious concern in many rural and suburban communities. Most of the small investor-owned utilities are a fall-out of land development where franchises were granted by a community and the system recognized by the State. Without borrowing capacity for improvements, or the organization and funds to cope with the rate-making process, these small systems have been a trial for regulatory agencies and a frustration to their customers and local governments.

State-owned water supply operations include the Delaware and Raritan Canal and the Spruce Run/Round Valley Reservoirs. Operations fall generally to the Water Supply Facilities Operations Element, but without the degree of independent operation and decision-making responsibility experienced in investor-owned systems. In recent years the State water utility has not been financially self-sustaining based upon revenues from users. An important aspect of State-owned supply operations is that, in general, any actions by the State serve as examples for other organizational systems.

Significantly, the five different types of purveyor organizations are subject to different financial requirements, which in turn provide them with different degrees of latitude in approaching their financial and pricing responsibilities. This observation is potentially one of the most crucial variables in analyzing the principles by which major purveyor pricing and financing is accomplished. By knowing which type of organization is being reviewed, a great deal is known about the principles and guidelines by which that purveyor pursues the pricing of water. Unfortunately, the standards utilized are not uniform by any means. This difference creates serious limitations on the operations of some water purveyors as utilities. It also threatens their ability to be self-sustaining, and it seriously weakens the stability of the overall water supply system.

## Water Law

In order to fully comprehend the existing governmental situation in New Jersey, it is important to understand the complexities of New Jersey's water law.

Like most states in the east, New Jersey's water law tradition is based on the riparian doctrine (Any person owning land which abuts a watercourse is a "riparian owner" and, as such, is entitled to use water in that stream so long as his activities do not adversely impact any other riparian owner). In reality, statutes developed to regulate this resource have significantly modified the common law status of riparian rights. By a series of legislative actions prior to 1907, the State made specific allocations of certain water resources of the State. Some of these "legislative grants" can be interpreted to represent massive quantities of water and had no consideration for the impact of such an allocation at that time and much less, impacts in the future. Other legislation developed since 1907 and until 1964, did not always have provisions for termination and revocation. This has resulted in serious problems as the management of this resource becomes more complex.

There is another situation that exists in New Jersey where there is a large quantity of water legally locked into "unallocated grandfather rights". When allocation procedures went into effect, owners of wells were given an entitlement of water equal to the pump capacities of their wells. Only on extremely rare occasions would a pump be operated at its maximum capacity. Yet, the determination limiting the allocation to pump capacity has, in effect, given permits for more water than may possibly be safely withdrawn. In 1976, total grandfather rights amounted to over 740 mgd. This, combined with the fact that holders of grandfather rights were not required to report usage, makes it difficult to properly manage the resource and assure a safe and adequate supply. Consequently, there is significant uncertainty over people's rights to use water and the duration and use of that water. These uncertainties create serious problems in managing and allocating the remaining resources. A sound water resource management system cannot function properly with these uncertainties. As stated earlier in this plan, modifications to the "Law Relating to Diversions of Sub-Surface Waters for Private Use", (N.J.S.A. 58:4A-1 et seq.) have attempted to improve this situation. More complete enforcement of this revised law is critical.

## Conclusions

This section has begun to point out some of the most significant issues surrounding water supply management in New Jersey. The "sub-tasks" prepared by the consultants include an in depth discussion of these and other problems associated with New Jersey water management.

The consultants recommended, and the State has concurred, that specific technical and governmental plans of action are needed to address these major problems.

The current crisis makes it painfully clear that we need to address these problems now. The goal for water supply managers is to be able to provide a safe and sufficient supply of water for the present and foreseeable future. This can only be done with an efficient use of the existing systems and supplies, a clear delineation of management responsibilities throughout the governmental and private system, self sufficiency and financial accountability at all levels, and intelligent preparation for the future.

The remainder of this plan will present the actions the State intends to pursue in order to meet these goals.

# PLAN OF ACTION

## II. PLAN OF ACTION

### A. Basis for Action: A Strategy

There are several basic principles upon which sound water supply planning should be based. It is on these principles, that the Department of Environmental Protection is basing its actions for water supply planning. These items represent the characteristics of a sound management system which the State intends to initiate immediately. We anticipate beginning to satisfy these goals with the technical and governmental actions detailed in the remainder of this plan. Environmental impacts and project costs will be a consistent governing factor in all evaluations of water supply alternatives. Annually DEP will evaluate successes and failures, and, if necessary, redirect activities or initate new activites. Approximately every five years, a more in depth analysis will be conducted on the status of our programs in respect to these goals and, wherever necessary, the plan will be redirected.

These principles will provide the framework for the sound water supply management system critical for the health and economic welfare of all New Jersey. Each one of these principles is essential to the sound management of water resources and their listing here does not represent priority.

One: All decisions with a potential impact on the water resources must be made in the framework of a comprehensive water resource management plan. This framework must be well defined and available for use by all levels of decision makers in the State.

It is no longer desirable that we carry out any form of development without regard for various potential impacts on water resources. This includes direct impact to a water body as well as indirect impacts due to land use. We must make certain that sufficient data is readily available to allow these decisions to be made intelligently and quickly. This management plan must recognize that an abundance of water does not automatically mean there is an abundance for drinking purposes. Therefore, the water quality - water supply relationship must clearly be reflected in all water resource management decisions, and be flexible enough to reflect the changing conditions throughout the State.

An effective watershed plan is essential to ensure the protection and continued availability for future development of our surface and groundwater sources.

Two: Accountability and responsibility must be identified and exercised at all levels of water supply management, within an understood, updated governmental system.

No system is capable of sustaining itself if major participants do not understand and accept their share of responsibilities. Limitations on State government's future role in water supply management are directly dependent upon accountable, responsible actions by other major participants.

To the extent that other governmental and private units understand, accept and properly execute their specific responsibilities, the State government will be able to limit its involvement.

Three: There must be an effective and responsive administrative structure for the resolution of water supply issues and problems.

The administrative structure should not impede the development of water supplies and the supportive action of suppliers. Neither should it be responsible for any activity that results in an overall negative impact on the resource. The allocation system must be modernized to address the complex issues associated with the evalution of water supply activites. Decisions must be made expeditiously, reflecting a total resource management approach.

Four: Responsibility for the development of water resources and the operation of water supply systems should be commensurate with the lowest level of government capable of being financially responsible for the particular water supply project.

With so many activities to be performed, there is a temptation to assign most of the resonsibility to upper levels of government, particularly State government. In formulating a program for water supply management, each participant must play a maximum role within the framework of its operations. Local development of resources and water system operations, through to the consumer, are local responsibilities. Small water companies, created with municipal approval, are municipal responsibilities. Major developments should be purveyor responsibilities when there is an available sponsor. However the State role must include certain important functions which analysis and experience indicates can not be adequately handled at lower levels.

Five: Decisions to utilize State capital for water resources projects must be subject to criteria that serve to promote self-sufficiency of all purveyors without undermining the most stable parts of the purveyor network.

Sufficient funds are not available to provide for nor does the State wish for complete assumption of the water supply function by State government.

It must be presumed that existing purveyors will continue to carry the responsibility of water supply operations in New Jersey. To discharge their utility functions, all purveyors must be financially self-sufficient based upon revenues from their customers.

The goal is not cheap water. The goal is an adequate supply of water at a dependable yield even in instances of droughts at a price which reflects the real cost of water including the difficulty in developing new supplies.

Any extensive State sponsored financial aid program should be available to all purveyors regardless of whether they are public or investor-owned, since all grants would be directed at achieving the public purpose of reducing drought/water supply problems.

> Six: To the extent that local government and individual purveyors do not carry out their responsibility in a manner that insures a dependable water supply, the State must assume a leadership role to fill the gap.

Most of the State's water supply systems are operated in an efficient and dependable manner; others, for reasons ranging from ignorance to severe economic constraints, have not been maintained properly. In these cases it must be the responsibility of the State to perform whatever duties are in its power to remedy the situation.

> Seven: The commitments of the State's resources - human and financial - to water supply management must be based on a greater recognition and perspective of areas outside the more populous northeast.

A Statewide program of water supply management must address the accumulation of issues faced by people from High Point to Cape May City at the same time the concerns of northeastern New Jersey, are addressed. The growing recognition of groundwater resources vulnerability throughout New Jersey represents a potential understanding of the Statewide responsibility and benefits of a water supply program.

> Eight: Intrastate water resources must be developed to meet existing needs, while development of interstate sources should be maintained as an overall, long-range objective.

The State believes that interstate resources (Hudson and Delaware Rivers) have the potential for large scale water supply projects. Due to complex legal, technical, political and environmental factors, these larger projects are not suitable for meeting immediate needs. Therefore, the pursuit of feasible intrastate supply projects will initially dominate the State's supply development activities to meet existing needs.

> Nine: The development and management of water resources must include consistent procedures to determine supply capabilities and provide plans to respond to stress conditions.

Evaluation of resource capabilities must take into consideration the backup source capabilities of interconnections, the management of resources in times of drought, and emergency response plans. No one backup is unique and all must work together to provide a better perspective of additional development needs.

> Ten: The State must work to implement an effective water conservation program.

The consultants defined water conservation as the wise and efficient use of water resources without adversely affecting lifestyles or industrial development. While not desiring an adverse effect to lifestyles or industrial development, the State does not object to changing water consumption practices to create an awareness and an understanding and appreciation of the limits of the resource. As demands on our supplies increase, the role of conservation in our water supply planning efforts will also increase in importance, particularly in times of drought.

> Eleven: All major water resource State planning decisions must be made in the forum of open and responsive communication and involvement.

Water is critical to everyone's everyday existence. Decisions made by the State have the potential for significant impact on individuals' lives. For this reason, the DEP must make every effort to assure that the public's information, interests, and concerns are incorporated in the DEP's decision making processes.

When viewed in the aggregate, these eleven premises form a strategic framework within which to present the technical and governmental recommendations. If these recommendations are implemented as proposed in the remainder of this section, the intended result will be the development of a balanced water management and governmental process that:

- is based on understood responsibility;
- institutes an effective administrative structure;
- promotes self-sufficiency and financial accountability at all levels;
- makes maximum use of existing systems;
- recognizes the foremost purpose of protecting and managing resources and furnishing an adequate supply of readily available, safe drinking water for the health and economic well-being of the State's citizens, communities and industry.

## B. TECHNICAL RECOMMENDATIONS

The Existing Conditions section outlined the present status of water supply in the State of New Jersey and indicated a number of problems which must be addressed immediately and some which require ongoing attention. For example, the resource capabilities of many of the purveyors in Region 1 have been stretched to such an extent that several key purveyors cannot meet 1980 demands reliably.

Supply capabilities have previously been estimated using a variety of procedures, which makes comparisons and management decisions on a region-wide basis impractical. Further, it is evident that the potential response of purveyors to emergency and drought conditions is hampered by lack of specific knowledge of the conditions of their interconnections and their access to support resources.

It is clear that actions of an immediate and coordinated nature are needed to solve these problems. These actions include implementation of specific projects to meet present deficits.

At the same time, actions are needed to confirm the condition and reliability of known interconnections so that surpluses can be effectively transferred to areas of need during emergency or drought situations. This action is justified for two reasons:

- Sound water management requires available backup capabilities to meet emergency situations.
- Certain purveyors have chosen to overuse their resources, thus endangering public health, safety and welfare.

As a supplement to interconnection testing and to improve overall management of existing resources, emergency and drought response plans must be developed. Emergency plans should be designed to meet unforeseen events, while drought response plans are necessary to meet long term, relatively predictable events. The specific policies and criteria upon which these plans should be based are detailed by the consultants in their Task 4E and Task 5C reports.

Finally, capabilities to successfully manage the development of the State's resources in the long term will be dependent upon the judicious use of water as a planning elements in purveyor as well as State management programs. Conservation in the form of wise water use cannot solve the State's immediate water supply problems but will be critical in proper management of the resource.

The technical recommendations are presented below, separated into two action periods:

- Immediate actions
- Actions after 1985

## IMMEDIATE ACTIONS

Immediate action is required to assure that the recommended surface water supply development projects in Regions 1 and 2 and the related development in Regions 5 and 6 are implemented and operational as soon as possible. Immediate needs in all other regions can be met by intelligent development of local groundwater supplies. (An in-depth evaluation of each preferred project is presented in the consultants' individual (Task 3) study outputs, as is the project selection methodology.)

Specific management action, including initiation of an interconnections testing program, development of drought and emergency response plans, implementation of conservation practices in all regions, and development of a potable source protection strategy will improve management of available water supplies and is recommended. The details of these recommendations are presented below.

### Regional Actions

It is emphasized that the regional technical programs described, particularly in regard to new projects, are primarily concerned with matching water resources to needs. Implementation and specific questions of sponsorship, funding, and other institutional factors are to be addressed on a project by project basis. Overall recommendations relating to many of these issues are also discussed under "Governmental Recommendations".

### Region 1

Water supply needs in Region 1 are only adequately successfully met when the area experiences above average rainfall. The consultants' finding that a probable deficit of 63 mgd existed in 1980 was a guide to the need for additional reliable water supplies based upon a repetition of a drought of the sixties. They went on to forecast future deficits of 107 mgd for 1990 and 150 mgd for the year 2000.

Although the State cannot evaluate the probability of the occurrence of more severe drought conditions, the Department of Environmental Protection will re-evaluate the magnitude of the estimated deficit for this and other regions when the current drought conditions have abated. DEP would also be in a position to ascertain any substantial changes in the capabilities of existing supply sources which may ultimately lead to the declaration of a new drought of record.

Furthermore, certain events subsequent to the consultants' report have substantially changed the situation as follows:

- Unexpected severe deterioration of water quality in the Passaic River has significantly reduced its supply capabilities, pointing to a need for flow augmentation during droughts in the future.

- The Commonwealth Water Company encountered severe flow shortages in the Passaic River which are partially relieved by relaxing environmental flow restrictions. The shortage in this system proved to be substantially greater than the estimates originally predicted by the consultants.

- The Elizabethtown Water Company's system is now being more strongly interconnected to the Newark Water Department and will soon be able to transfer 30-35 mgd during drought periods with water available from the Raritan River Basin.

- The Delaware and Raritan Canal, assumed by the consultants to have a dependable supply of 75 mgd, had its drought allocation from the Delaware River reduced by 13 mgd for a maximum supply of 62 mgd.

Based upon the foregoing conditions, DEP has reconsidered the consultants' recommendations for a list of permanent water supply projects and reviewed nine main options during the course of the drought. The alternatives considered for the region are:

(a) Additional storage reservoirs in the Passaic and Raritan River basins such as the Washington Valley, Dunkers Pond, Longwood Valley, Monksville and Six Mile Run

(b) Wanaque South, a combined storage and pumping project to increase the yield of the Wanaque System

(c) The Elizabethtown-Newark Interconnection, and the Raritan-D&R Canal Interconnection

(d) The Raritan-Passaic Pipeline

(e) Confluence Reservoir, pump station and force main

(f) Other interconnections

(g) Rehabilitation of existing water systems

(h) Various other minor projects of local impact

(i) Improvement of D&R Canal capacity to 100 mgd.

Preliminary evaluations by both the consultants and the State show the need for detailed feasibility studies on the additional storage reservoirs.

The Confluence Reservoir is designed to increase the yield from Spruce Run-Round Valley. Accordingly, construction should be phased with the utilization of the existing Spruce Run-Round Valley safe yield.

The safe yield from Spruce Run-Round Valley is estimated at 160 mgd in continuous flow*, of which 80 mgd** has been contracted. DEP feels that it is necessary to improve existing transmission facilities in order to move up to 30 mgd during times of drought to the Newark system. This water can be treated in the existing Elizabethtown plant at Bound Brook.

Another 40 mgd can be moved during time of drought by the proposed Raritan-Passaic Pipeline. It is important to note that this water is needed only about 10% of the time in amounts that would average 15 mgd for the worst drought year ever recorded. This water must be pumped over the Watchung Mountains but the year-round energy costs involved will be minimal because of the intermittent and limited periods of pumping (approximately 6 months in every ten years). This project also will provide the needed water for flow augmentation during severe drought to reduce the concentration of ammonia and other pollutants originating from numerous wastewater treatment plants in the Passaic Basin. This above analysis is predicated upon the construction of the Wanaque South Project by the sponsoring purveyors.

---

* Available with maintenance of the full 90 mgd environmental low flow at Bound Brook.

** An additional 10 mgd is, at the time of this printing, under temporary contract.

Table 4.

### Capital Costs of Alternatives to Increase Safe Yield in Passaic River Basin

| | Project | Estimated Constr. Cost (millions$) | Added Safe Yield | Estimated Constr. Cost Per MGD added Safe Yield | Annual Cost for Amortization per (4) mgd Safe Yield |
|---|---|---|---|---|---|
| 1. | Elizabethtown-Newark (Ph. I) | 7 | 20 | $350 Thousand | $ 32,500 |
| 2. | Raritan Passaic Diversion | 32.5(2) | 40 | $810 Thousand | $ 75,300 |
| 3. | Wanaque - South | 55 (1) | 64(5) | $780 Thousand | $ 72,500 |
| 4. | Monksville | 24.3 | 25 | $980 Thousand | $ 91,000 |
| 5. | Longwood Valley | 24.1 | 12 | $2 Million | $186,000 |
| 6. | Dunkers Pond | 30 | 5 | $6 Million | $558,000 |
| 7. | E'town - Newark (Ph. II & III) | 47 (3) | 25 | $1.9(3) Million | $176,000 |

(1) Without Oradell Pipeline.

(2) Assuming Half Cost and 45% Yield Allocated to Water Supply. Full cost of project is $65 million

(3) Plus Additional Treatment Costs.

(4) Amortized in 40 years at 9%

(5) Could increase to 7% under more favorable water quality conditions in the river.

Summary: Demand/Supply

Region 1 (Northeastern New Jersey)

Assuming that the current drought will not be worse than that of the sixties, the projected deficit for the region is approximately 107 mgd (including consideration of the drought's effect on the D & R Canal and Commonwealth situations).

To meet this demand, the proposed projects would provide the following yields:

| | |
|---|---|
| Elizabethtown-Newark Interconnection | 20 mgd |
| Raritan-Passaic Diversion | 40 mgd |
| Wanaque - South | 64 mgd |
| | 124 mgd |

The projects were selected on the basis of comparative costs, as indicated in Table 3. The indicated total safe yield of these projects will exceed the projected total deficits by 17 mgd, which is only about 2% of regional demand and is well within the probable error of the estimates.

The figures in Table 4 include only capital costs. Operating costs must also be taken into consideration in evaluation of these projects. For many of these projects, accurate estimates of operating and maintenance costs are not available, but consultants' estimates have recently been made for both the Raritan-Passaic Diversion* and the Monksville Project.** The analysis shows that the Raritan-Passaic Project is more costly to operate due to electric power costs associated with the pumping of the water.

Table 5.
Comparison of Operation and Maintenance Cost
Raritan Passaic Pipeline and Monksville Reservoir

| | $/million gallons of safe yield |
|---|---|
| Raritan - Passaic Pipeline | $7,090 |
| Monksville Reservoir | $1,640 |
| difference | $5,360 |

Since this difference in amortized capital costs is $15,700 per year ($91,000 for Monksville and $75,300 for Raritan - Passaic Pipeline), the increased operating costs for the pipeline, even

---

* Summary Report on the Feasibility Study Raritan Passaic Water Transmission Pipeline Project," URS Co., Inc., May 1981

** Wanaque South Project - Economic Feasibility Study," Vol. 1, Clinton Bogart Associates, 1981

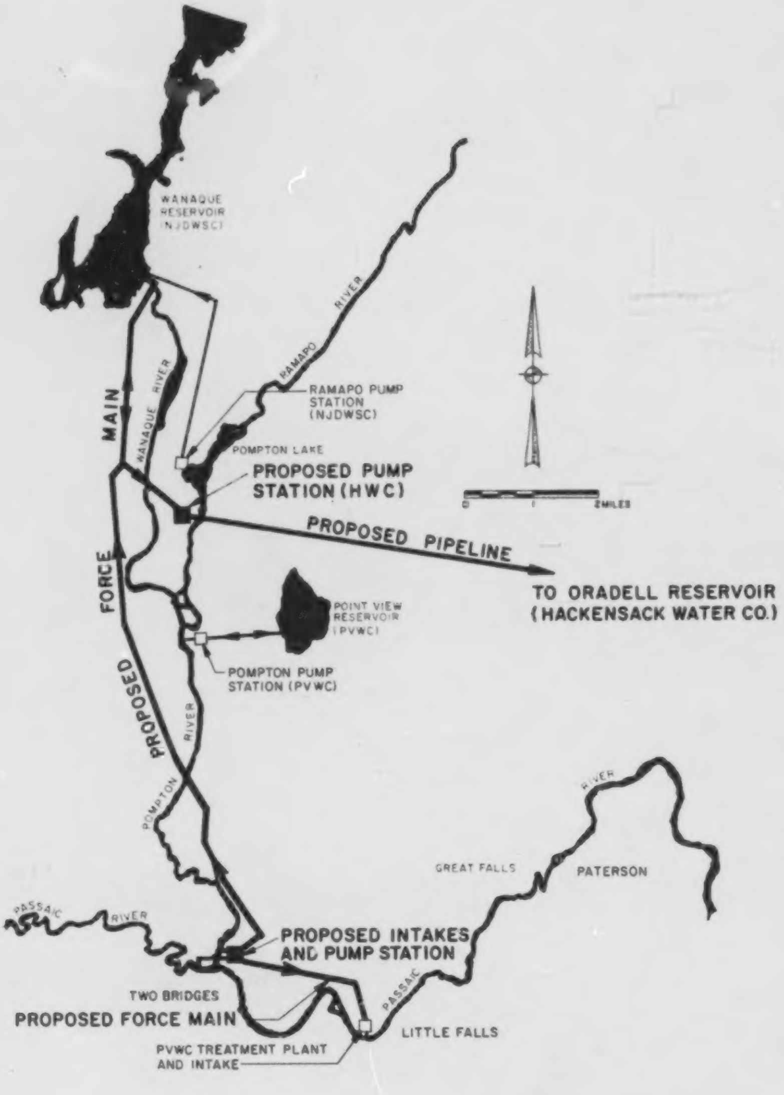

WANAQUE RESERVOIR (NJDWSC)
RAMAPO RIVER
RAMAPO PUMP STATION (NJDWSC)
WANAQUE RIVER
MAIN
POMPTON LAKE
PROPOSED PUMP STATION (HWC)
0 1 2MILES
PROPOSED PIPELINE
TO ORADELL RESERVOIR (HACKENSACK WATER CO.)
FORCE
POINT VIEW RESERVOIR (PVWC)
POMPTON PUMP STATION (PVWC)
PROPOSED
POMPTON RIVER
RIVER
GREAT FALLS
PATERSON
PASSAIC RIVER
PROPOSED INTAKES AND PUMP STATION
TWO BRIDGES
PROPOSED FORCE MAIN
PASSAIC
LITTLE FALLS
PVWC TREATMENT PLANT AND INTAKE

FIGURE 3

WANAQUE SOUTH PROJECT

N.J. STATEWIDE WATER SUPPLY MASTER PLAN

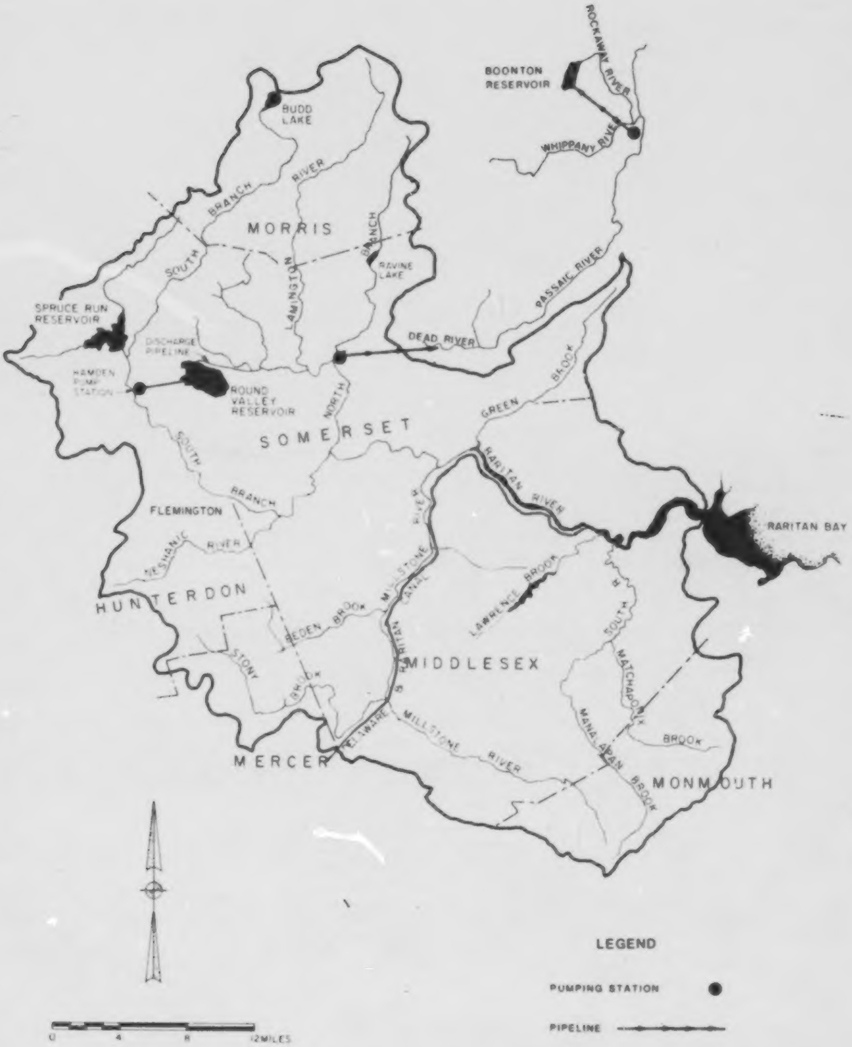

ROCKAWAY RIVER
BOONTON RESERVOIR
WHIPPANY RIVER
BUDD LAKE
SOUTH BRANCH RIVER
MORRIS
LAMINGTON
NORTH BRANCH
RAVINE LAKE
PASSAIC RIVER
DEAD RIVER
SPRUCE RUN RESERVOIR
DISCHARGE PIPELINE
HAMDEN PUMP STATION
ROUND VALLEY RESERVOIR
NORTH
SOMERSET
GREEN BROOK
SOUTH BRANCH
RARITAN RIVER
RARITAN BAY
FLEMINGTON
NESHANIC RIVER
HUNTERDON
MILLSTONE RIVER
DELAWARE & RARITAN CANAL
BEDEN BROOK
LAWRENCE BROOK
SOUTH R
STONY BROOK
MIDDLESEX
MATCHAPONIX
BROOK
MANALAPAN BROOK
MILLSTONE RIVER
MERCER
MONMOUTH
0
4
8
12MILES
LEGEND
PUMPING STATION ●
PIPELINE

FIGURE 4

RARITAN PASSAIC PIPELINE

N. J. STATEWIDE WATER SUPPLY MASTER PLAN if energy costs were to double, does not change the greater cost effectiveness of the diversion project and a more detailed analysis of costs of these projects is given in Appendix 1.

When constructed, these projects would provide reasonable supply balance if the drought of the sixties is not surpassed. The risk of a greater future drought is countered by possibilities of reducing demand by temporary behavioral changes in water use practices, and emergency measures such as those used during the current drought.

Two other major improvements in existing facilities of this region, which DEP feels are essential for proper operation and management of water supplies, are the Great Notch Multiple Exchange Facility and improvements on the Delaware and Raritan Canal.

A recharge and conjunctive use impoundment is required to improve water supply in the South River area of Middlesex County. This should improve aquifer recharge, reduce dangers of saltwater intrusion and provide for interconnections with adjacent systems. A feasibility study will be required to determine the scope and economic justification as a prerequisite, in order to achieve the full potential of this project.

An interest has been expressed in expediting construction of the Six Mile Run Reservoir, in order to help meet water needs projected by Middlesex County which are greater than those forecast by the State's water supply consultants. However, the availability of water from the Round Valley-Spruce Run facilities is not being fully utilized nor have commitments been made to utilize the increased flow expected from the D&R Canal and its Raritan River Pump Station. It is not expected that the demand for water in this area will grow rapidly enough to warrant immediate construction of the Six Mile Run Reservoir. However, if this increase demand should develop, the State will expedite construction of the Six Mile Run project or an alternative project to meet this need.

The question of possible State funding of water treatment plants has also been raised. It is certainly true that the large cities have faced many difficulties in financing the construction and modernization of water treatment plants. At this time the established State policy is that private and public purveyors should provide water treatment at their own expense. It is considered that this problem should be addressed in the next major revision of the Master Plan.

The Delaware and Raritan Canal improvements include dredging the canal and removing vegetation to improve its capacity from less than 75 mgd to 100 mgd. Rehabilitation of control gates and structures is also included in this project. The 1980 cost of these improvements is estimated at $3.7 million. Further details of the projects described above may be found in the extensive analyses of Task 3 of the consultants' source material.

In order to manage the region in an integrated and efficient manner, it is necessary to make provisions so that temporary surpluses in one system are transferred to remedy deficits in another system. Purveyors have been hard pressed to avoid adverse impacts of a major drought and other emergencies without this ability to transfer surplus supplies. For this reason, interconnections between this complex network of purveyors are essential.

Unfortunately, in many cases the condition and carrying capacity of the emergency links are unknown and a program to test interconnections should be initiated immediately. A testing program to verify the condition and flow capacities of the interconnections of these major purveyors would greatly assist their ability to meet future demands. Such a program would be of the greatest benefit by focusing on the interconnections of the Hackensack Water Company, Jersey City Water Department and Newark Water Department and the Passaic Valley Water Commission (PVWC).

Flexibility of water transfers among purveyors allows for improved response to variable stress conditions. A multiple exchange facility at Great Notch between the NJDWSC, Newark, PVWC and Jersey City systems should be built to provide for coordinated transfers of supply during emergencies. (Options are also available for continuous service.)

Several minor but vital elements of this facility were constructed in response to the current drought. As one example, DEP ordered improvements to facilitate the transfer of water between the Jersey City and NJDWSC aqueducts at a time when Boonton Reservoir was spilling and Wanaque Reservoir was filled to only 75% capacity. The interconnection improvements allowed for a 20 mgd transfer between these systems, saving a significant amount of water which would otherwise have been lost .

Aside from the construction of portions of the Great Notch Multiple Exchange Facility, the legislature and the Governor acted to provide funding for a number of emergency water supply projects to improve the purveyors' ability to meet demands during the current drought. These projects are designed to provide more efficient distribution and utilization of existing supplies. These emergency projects are discussed below.

1. George Washington Bridge Interconnection - Construction of a pipeline across the George Washington Bridge to tie into the New York City system on one end and the Hackensack Water Company's system on the New Jersey side. The purpose of the interconnection is to allow the "transmitting" of a portion of the New Jersey Delaware River Basin allocation of water through the New York City aqueduct into New York City and thence across the bridge to New Jersey.

2. Raritan River and Delaware & Raritan Canal Emergency Interconnection - This project will replace water to the canal that is normally supplied by the Delaware River so that New

Jersey's allocation to Delaware River waters can be brought into the areas hit by the drought from Lake Hopatcong and from New York City's facilities with a pipeline across the George Washington Bridge.

3) Bolster Interconnection Between Elizabethtown Water Company and the Newark Water System - Elizabethtown Water Company provides water to the City of Newark on an off peak basis through existing interconnections. These interconnecting facilities have the capability of providing approximately 20 mgd at best, when the conditions in the Elizabethtown System and Newark System are under ideal conditions. The sustained transferrals approximate 16 mgd. This project will improve the Elizabethtown's system capability to provide an additional supply of 12-17 mgd on a more sustained basis and would provide pumping capabilities for the Newark system to accept this.

4) Passaic Valley Water Commission Treatment Plant Improvements- To make full use of its Passaic River supply, the State supported the rehabilitation of certain treatment components and the expansion of its chemical treatment capacity. These measures are designed to permit use of up to 75 mgd of Passaic River water at the treatment plant during drought conditions.

In addition to the activities mentioned here, specific groundwater studies are proposed for this area of the State. These studies are addressed collectively in the section of this plan titled "Groundwater Studies in Key Areas."

Region 2 (Ocean and Monmouth Counties)

Water supply needs in Region 2 are expected to increase from 13 mgd in 1980 to 30 mgd by 1990. Groundwater supplies in the northern area of the region are at present experiencing problems from overdrafting and potential saltwater intrusion. For this reason, the consultants suggested that needs can best be met with development of surface water supplies located within the region. DEP concurs with the recommendation for development of the Manasquan Project which consists of two reservoirs as shown on Figure 4 subject to resolution of certain environmental concerns. The lower reservoir, which is off channel is designed to bypass low flows and will yield up to 10 mgd. The upper reservoir is located off-stream and will receive flows from a pump diversion on the Manasquan River. This reservoir, with a capacity of 5 billion gallons, can provide a yield of 25 mgd. The estimated cost for these facilities is $40 million.

The immediate construction of both reservoirs will provide 35 mgd by 1985, when needs are expected to be about 20 mgd. The region is impacted to a large extent by summer residents and these provisions for additional supply will serve to satisfy this summer influx while improving overall water management capabili-

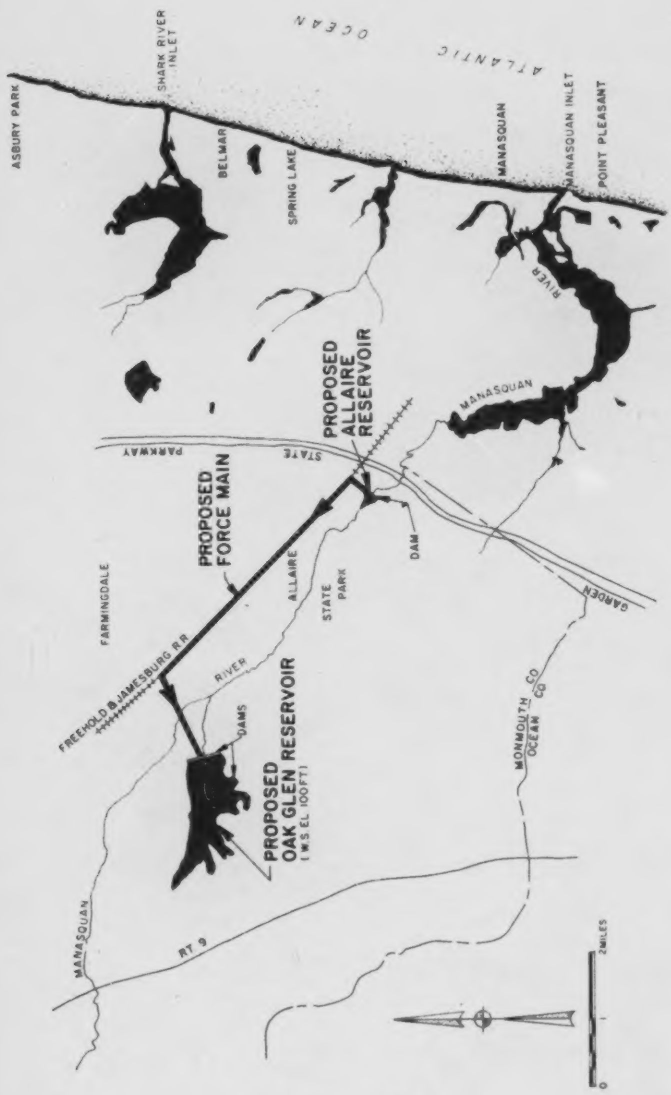

ASBURY PARK
SHARK RIVER INLET
ATLANTIC
OCEAN
BELMAR
SPRING LAKE
MANASQUAN
MANASQUAN INLET
POINT PLEASANT
RIVER
MANASQUAN
PROPOSED ALLAIRE RESERVOIR
STATE
PARKWAY
GARDEN
PROPOSED FORCE MAIN
DAM
FARMINGDALE
ALLAIRE
STATE PARK
FREEHOLD & JAMESBURG R.R.
RIVER
DAMS
PROPOSED OAK GLEN RESERVOIR (W.S. EL 100FT)
MONMOUTH CO
OCEAN CO
MANASQUAN
RT 9
2MILES
1
0

FIGURE 5

MANASQUAN RESERVOIR PROJECT

N J STATEWIDE WATER SUPPLY MASTER PLAN

ties in the region. Local purveyors will benefit from this project, which should satisfy needs in most of Monmouth and northern Ocean Counties. Several environmental concerns have been raised about the project, yet DEP feels that these concerns can be addressed and the problems solved

In addition to surface water project mentioned here, specific groundwater studies are planned for this area. These studies are addressed collectively in the section of this plan titled "Groundwater Studies in Key Areas."

Region 3 and 4 (Atlantic, Cape May, Salem, Cumberland)

While no major projects are recommended, an expanded Statewide groundwater monitoring effort with emphasis on groundwater modelling is of vital importance to these regions since they rely totally on groundwater supplies and the threat of contamination by indiscriminate actions is ever present. The consultants' groundwater management recommendations (Task 7) detail the necessary steps to protect and maintain the water supplies in these regions.

Groundwater studies to be undertaken are described collectively further in this report after this regional discussion.

Region 5 (Burlington, Camden, Gloucester)

The unmet needs in this region are expected to increase from about 5 mgd in 1980 to 15 mgd in 1990. Although local groundwater sources may be able to meet these needs, their quality is in serious doubt. The contamination of some wells and the general salinity problem require that substitute supplies be developed in the Camden area. The use of substitute supplies will directly benefit the overpumped aquifers. The construction of a surface water intake on the Delaware River or the transport of water from Philadelphia, will provide a substitute supply. The salinity problem is currently being studied by the DRBC and the Corps of Engineers. The results of this study may affect the frequency and duration of operation for the proposed surface water facility.

The Pine Barrens Region of the State also offers a potentially significant source of substitute supplies for the Camden area. The recently enacted Pinelands Protection Act mandates the development of a Pinelands Plan which is now undergoing further review. Use of water resources in this region must take such planning efforts into consideration as well as recent legislation limiting the distance to which this water may be transported. The City of Camden has recently taken a number of steps (which include the relocation of several supply wells and the reconstruction of a potable water treatment plant) to protect and upgrade its water supply system. However, the region as a whole is still vulnerable to overdrafts and pollution. A feasibility analysis must be undertaken immediately to identify most favorable course of action to take.

Additional groundwater studies are suggested for this region and are discussed later in this report (see "Groundwater Studies in Key Areas").

Low flow augmentation of the Delaware River has been deemed to be critical in order to respond to surface and groundwater quality problems. The Tocks Island Lake Project was viewed as the best source of flow augmentation for this purpose; however, as explained previously, the present status of this project does not make it suitable as a response to the immediate or near-term needs of the area. A dam on the Musconetcong River in the vicinity of Saxton Falls to form a reservoir referred to as the proposed Hackettstown Reservoir was selected by the legislature as a potential project in 1969. Acquisition of land for the site of this project was authorized at that time, and much of it has subsequently been acquired. Until the summer of 1980, based upon information available, the Department considered this project to be a feasible means of providing low flow augmentation on the Delaware River. Additional investigation, in particular, recent test borings have raised serious question about the economic viability of this particular project. In response to problems encountered with the Hackettstown Project and in an attempt to develop the best project to satisfy the needs, the State will now concentrate on other alternatives. Recent examination of the Merrill Creek Project shows a potential temporary surplus capacity and there may exist an opportunity for State participation in that project as a step towards meeting New Jersey's obligations for low flow augmentation to the Delaware River. Therefore, the State will investigate this alternative with the participating utilities, while still pursuing other options.

Use of groundwater from aquifers for this purpose will also be reconsidered.

### Region 6 (Northwestern New Jersey)

The needs in this region are expected to increase from about 4 mgd in 1980 to about 11 mgd by 1990. Sufficient supply can be diverted from the Musconetcong River, the Delaware River, and local surface and groundwater resources to meet year 2020 demands without recourse to a reservoir project.

Although major water supply projects are not needed in Region 6 for the foreseeable future, any New Jersey requirement for augmenting flows in the Delaware River would have to be met by a project situated in the higher elevations of the State. In view of the deferred status of the Tocks Island Project, the Hackettstown Reservoir was considered for development by the State. As discussed previously, it has been determined, because of technical problems to defer work on the Hackettstown Project and look to other projects to meet this need.

In addition, any facility developed could be considered to provide for local water supply when and if the need arises.

Low flow augmentation also plays a key role in the discussion among the states in the DRBC regarding future development of the Delaware River. As such, New Jersey stands to benefit from a low flow augmentation project in two respects: the maintenance of groundwater and surface water quality in the river; support for a potential surface water intake in the Tri-County Region. Low flow augmentation would aid in preventing saline water in Delaware Bay from traveling upstream to Camden where groundwater quality due to induced infiltration is largely dependent upon the river's quality. In coordination with the surface water intake project in Region 5, the low flow augmentation can provide required releases to the Delaware River to mitigate drought impact on low flows. The reservoir would also provide important recreational opportunities.

In addition, any facility developed could be considered to provide for local water supply when and if the need arises.

Although the Tocks Island Lake Project would satisfy the current need for low flow augmentation, it would take at least twenty years to have it on line and operating. As an immediate solution to the water resource problem in Region 5 and 6, the State recommends that New Jersey participate in the construction of a low flow augmentation project as soon as possible.

As discussed previously, the State will look to other projects to meet these needs, including use of groundwater from aquifers.

## GROUNDWATER STUDIES IN KEY AREAS

As stated earlier in this Plan, the absence of an adequate data base is particularly acute with regard to geologic and hydrologic information. Critical decisions are being made and will continue to be made which have a potential impact on our groundwater supplies. In order to secure reliable information in the most critical areas of need related to groundwater protection, the Department intends to undertake the following studies.

### Groundwater In The Buried Valley Aquifers

In the northern part of New Jersey one of the greatest potentials for future groundwater sources is the buried valley sand and gravel deposits. Many parts of North Jersey contain sand and gravel, but the deposits only reach sufficient thickness to supply large capacity wells when they fill in "old" deep valleys. Some of these valleys have been mapped in parts of Morris and Essex Counties during the droughts of the 1960's and 1980-1981 in order to supplement depleted public supplies. Since the buried valleys are not evident from the surface they can only be mapped through extensive test borings and geophysical survey programs. A recent survey and test well program of parts of the Rockaway and Pequannock Valleys indicates the potential to locate public supply wells in certain areas. The program, which started as a result of the 1980-1981 drought, should be expanded to evaluate the rest of the Rockaway Valley, the Great Swamp Area and the East Hanover Valley. The delineation of these areas and defining the various interconnections between valleys will not only aid in the development of the water resources, but will aid in delineation of the areas of groundwater contamination. Parts of the Rockaway have experienced severe groundwater contamination and accurate knowledge of this valley can not only help determine new well locations, but also help evaluate where the pollution may go in order to develop a clean-up strategy.

There are numerous other areas which contain potential buried valleys in the northeastern part of the State although the valleys may not be as extensive as those in Morris and Essex Counties. In the northwestern part of the State, (western Morris, and Passaic Counties along with Sussex and Warren Counties), there are other buried valleys, some of which have exceptional potential as water producers. These also will have to be evaluated through a geophysical survey and test boring system. (Regions 1 and 6).

### Water Level and Water Quality Monitoring-Coastal Plain:

Long term water level records are needed to evaluate the status of groundwater resources in each aquifer. This information is necessary to provide documentation of the effects of natural variations and the effect of development on the changes in groundwater storage, flow direction, and water quality.

Present groundwater monitoring is inadequate to allow proper planning and management especially where aquifers are threatened by saltwater intrusion in the coastal plain of central and southern New Jersey. New monitor wells should be constructed and/or abandoned wells utilized to provide this important data which should then be examined and detailed annually in a status report. This report would be useful for all planning and regulatory efforts in New Jersey.

This can be accomplished by collecting data from select wells to: (1) identify variations in lithology, salinity, and temperature in the vertical section; (2) define physical conditions associated with well construction such as depth, screened interval, diameter, direction, and rate of borehole flow, and integrity of well casings; (3) identify wells which can be added to the Observation Well Network, (USGS project in the coastal plain consisting of a series of wells constantly measuring fluctuating groundwater levels.) (Region 2,3,4, and 5).

In addition, a recent groundwater movement study in the Cohansey aquifer has resulted in the development of a hydrologic simulation model describing the interaction of streams and swamps with the shallow groundwater system in the Mullica River basin. (Special Report 36, "Geology and Water Resources of the Wharton Tract and the Mullica River Basin in Southern New Jersey", USGS.). This model has been calibrated for steady-state conditions using data collected within the Wharton Tract. There is a need to expand the model so that the effects of seasonal water levels and streamflow fluctuations coupled with increasing water use can be evaluated. There is also a need to expand the area covered by the model because of projected growth in Atlantic County and other parts of the coastal plain. Additionally, this simulation model is needed to complement the regional model being completed under the Federally funded RASA Project which is modelling the deeper aquifer. (Region 3 and 5).

Due to the unique characteristics of the Pinelands National Reserve, special attention to this region is appropriate. The recently designed Pinelands National Reserve encompasses a sparsely populated, undeveloped region of nearly 1 million acres in the Atlantic Coastal Plain of central New Jersey. The region contains extensive surface and groundwater resources of high quality and includes the 150 square-mile Wharton Tract which was purchased by the State of New Jersey in 1954.

The New Jersey Department of Environmental Protection has amended the Surface Water Quality Standards to include water quality standards for designated tidal and freshwater streams and groundwaters within the Pinelands. These standards recognize that the unique environment of the Pinelands has created natural water quality conditions which are quite different from those found in other areas of the State. There is a lack of detailed knowledge, however, as to the variations in water quality within the Pinelands region due to differences in soils and geology, topography, and land use. Existing surface and groundwater data from various sources needed to be compiled, evaluated, and continually updated. The data should be analyzed by a number of methods in order to characterize differences in water quality throughout the area. Estimates of dissolved solids loading should be calculated at selected stations, where possible. The results of such a program would aid in the selection of strategic groundwater and surface water sampling stations to optimize the effectiveness of the existing water quality surveillance network in this portion of New Jersey and would provide a valuable base of surface and groundwater quality information necessary for the management of the Pinelands water resources (Region 2,3,4, and 5).

Population growth in and around Atlantic City and other shore communities has increased pressure for the development of water resources in this area. There are only two aquifers for water supply development, the Cohansey and the Kirkwood "800 foot" Sand. Heavy withdrawls from the Kirkwood Sand will increase the rate of saltwater moving inland from the portion of the aquifer containing saltwater. Water levels in the Kirkwood are already greater than 70 feet below sea level in some wells and streamflow will likely be reduced as pumpage in the Cohansey Aquifer is increased. Water quality in the Cohansey is being threatended by illegal dumping and the movement of saltwater from the estuaries. In order to manage the groundwater in this area a model must be constructed. In order to construct such a model extensive hydrologic, geologic, and water quality data must be collected including the drilling of new monitor wells to determine aquifer characteristics. (Region 2,3, and 4)

In addition to the need to collect detailed information about the quality and volume characteristics of the regions' groundwater, specific information must be developed about the subsurface geological characterisitics. Specifically, this includes studies on the following areas. Pollution of groundwater in the Potomac-Raritan-Magothy Aquifer system is endangering the major source of water for a portion of southern New Jersey. This aquifer is the major source of water for Camden, Gloucester, and Burlington Counties. It has been estimated that 50% of the water withdrawn from the aquifer in those counties is induced from the Delaware River. However, there is insufficient data to accurately measure the actual amount of recharge and its effect upon groundwater quality. It will be necessary to collect water quality and hydrologic data in order to construct and operate a model which will answer the recharge and groundwater quality questions. There should be an in-depth review of the existing data and collection of additional geohydrologic and streamflow data along the outcrop area. Recent information indicates that the water level in the uppermost part of the aquifer system is below mean sea level at some locations. Shallow wells should be located near deeper wells in order to determine the head difference between parts of the aquifer system. (Region 4 and 5)

Recent field studies by the State confirm the concept that the Merchantville-Woodbury Formations, especially the Woodbury, always perceived as an impermeable clay formation is indeed highly permeable at different areas in the Coastal Plain. This characteristic can allow for rapid pass-through of water and/or other liquids such as landfill leachates, chemical pollution, etc. This phenomena has already been observed in Monmouth and Mercer Counties, however, studies indicate that there may be other zones that exist along the entire length of the formation from Salem County northeastward to Raritan Bay.

Previous reports proposing the Woodbury as an impermeable unit for landfill siting and as an aquiclude between the upper and lower aquifers may be misleading. Before any actions are taken which determine use of these areas, the possibility of downward migration of pollutants into the lower aquifers must fully assessed and therefore, it is imperative that the Woodbury Formation receive a priority status to map and assess those regions or zones that may be fractured. (Region 2,4, and 5) This is one example of the importance of adequate geologic and hydrologic data in water resources management decision making.

## Land Subsidence

Land subsidence, probably due in part to artesian head decline, is occurring along the Atlantic Coastal Area of New Jersey. Data from the National Geodetic Survey (NGS) indicates that Atlantic City and parts of the area surrounding Great Egg Harbor Bay and Absecon Bay have subsided relative to central New Jersey. Other coastal areas from Ocean City to Sandy Hook also may be effected. Extensive problems can be caused by subsidence: well casings may collapse due to compression of compacting sediments; structures and sewer lines may fail due to differential subsidence of land surface; near-shore subsidence can cause loss of land and beaches because of inundation; groundwater storage capacity can be reduced; and saltwater intrusion into fresh water aquifers could be accelerated. Knowledge of the magnitude and extent of subsidence is essential to avoid severely impacting engineering structures, beaches, and streams. The purpose of this study would be to define the extent, rate, and magnitude of subsidence and to determine the depth range within which compaction of sediments is occurring. (Region 2 and 3)

## Evaluation of Contaminated Well Fields and Alternative Supplies

Several areas of the State have already experienced serious water supply losses due to groundwater contamination. Parts of the State have been forced to develop alternative supplies due to the presence of toxic substances in their groundwater. Evidence points to an increase in these occurrances in spite of expanded attention being paid to the control of waste products and to land use practices.

Extensive data collection and management programs have been proposed to collect and prepare background information throughout the State. In addition, there is the emergency need to investigate and evaluate groundwater in areas where there is suspected or known contamination. (Statewide)

Procedure For Water Supply Project Selection

It is the intent of the Department of Environmental Protection to support the activities cited in the "Action Program 1981-1985" with funds made available from the passage of the 1981 Water Supply Bond Act. In accordance with the conditions of this act, all projects or programs to be funded through the bond issue must have funds specifically appropriated by the legislature. The purpose of the condition is to insure the people of New Jersey a channel of input to the selection process and expenditure of bond funds.

In order to provide all affected segments of the public with additional opportunity to review and comment on major capital water supply projects, the Department is committed to the following review process:

1. In accordance with priorities established in the Master Plan, the Department will request money for feasibility studies from the Legislature. Subject to approval by the Legislature and Governor the Department will begin preparation of a detailed feasibility report. During the preparation of the study, the Department will hold at least one (or a series if appropriate) public informational meeting in the area(s) of impact. The purpose of these meetings will be to explain the water supply needs, present the options being considered, solicit information from the public and respond to the publics' questions, to whatever extent possible. The Department will solicit the involvement of the Water Supply Advisory Council in the preparation and conduct of this meeting(s). The information gathered at the meeting(s) will be used in preparation of the feasibility report and questions left unanswered at the meeting(s) will be answered during the preparation of the feasibility study. The feasibility study will include the technical, economic and environmental consideration of the project.

2. Upon completion of project feasibility study and environmental assessment, and again in consort with the Water Supply Advisory Council, the Department will take each major capital project to the public for discussion at one, or a series if appropriate, of public hearings in the area(s) affected. This feasibility study and environmental assessment will, at a minimum, include a discussion on the potential environmental impacts and appropriate measures to mitigate these effects. There will also be detailed economic assessment of the proposed project. This assessment will include capital as well as operation and maintenance costs over the lifetime of the projects as part of a comparative analysis of the recommended project to its alternatives.

3. Formal records will be kept of the meeting(s) and each meeting will be followed by distribution of a response document which presents amendments to the project if appropriate, and response to questions/concerns raised. The response document will include our proposed action. If the determination is made to proceed with the project, the next step towards appropriation of funds will be identified.

4. Once the State is satisfied that it has the most acceptable project, it will be submitted, along with a copy of all testimony and response, to the Capital Budget and Planning Commission. With their concurrence, the project will be presented to the Senate and Assembly Appropriations Committees. The 1981 Water Supply Bond Issue requires the specific legislative approval for all expenditures thereby allowing for this additional opportunity for public input directly to the legislature.

5. Upon appropriation of funds, design and construction of the project will be undertaken by the Water Supply Autnority, purveyors or other appropriate entity.

The above procedures are those that will be followed regularly in initiating new projects. However, in the event of serious emergencies, the legislature will be asked for funding, and work may be conducted under the emergency powers.

It is important to realize that, at this time, several of the "immediate action" projects listed in this Master Plan are in various stages of development. Feasibility studies and environmental assessments on some of the projects noted have already been completed and presented to the public. These projects have also had funding previously committed through passage of prior bond issues. In relation to these projects, the Department is committed to a public involvement process that picks up from the point already completed and follows the above process to completion.

Several of the activities listed in the "Action Program" are not specific projects. Public involvement with these programs will be carried out with the Department's own public involvement program. If funding from the proposed 1981 Water Supply Bond Act is required to finance activities from these programs, the legislative process for appropriations, as described, will be followed.

## Action in All Regions

In addition to the specific project developments described above, the State and purveyors must address a number of issues of a management and operational nature. These include:

- Interconnections
- Drought Response Plans
- Emergency Response Plans (Non-Drought Related)
- Yield and Low Flow Analyses
- Planning Information Storage and Update
- Repayment
- Potable Water Source Protection
- Conservation Program
- Water Treatment Process Problems

Interconnections.

Interconnections are critical components of the overall water supply planning strategy in the State for both the immediate and long term periods. In some cases, interconnections are the sole sources of water for large centers of use or the only source of emergency supplies.

A statewide program to test and analyze existing interconnections is essential and, in the management of this program, purveyors should be assisted by the State. Needs for rehabilitation of existing interconnections and for construction of new ones can then be evaluated, followed by an action program to implement the necessary work.

DEP, as a drought response measure, had ordered the use of various interconnections to infuse substantial quantities of water from various sources to support needy systems.

Final planning, design and construction for the balance of the major water exchange facility at Great Notch will require a feasibility study. The Wayne and Chintenden Road pumping stations are being built with emergency funds. Another area requiring early consideration of interconnection construction in the South River area of Middlesex County.

Drought Response.

The overall ability of the State to withstand the adverse impacts of a major drought emergency is dependent on two critical factors: (1) having sufficient supplies available to meet needs during the stress period and (2) managing those supplies in an efficient and timely manner. Implementation of the projects described earlier will serve an important role in providing additional yield both for normal and drought conditions. Ensuring that these and existing supplies are available where and when needed requires that each purveyor prepare a drought response plan outlining anticipated requirements for water and the measures that must be taken to comply with the objective of a safe and adequate water supply during drought.

Experience has shown that the public will cooperate more completely in a plan that is properly articulated, uniformly followed, and fairly enforced, as opposed to those formulated hastily during the time of drought crisis.

Since the ability of an individual purveyor to respond to a drought is a function of the reliability of its own resources, the availability of interconnected back-up supplies, and the particular internal capabilities of the system, the measures to be implemented in a drought will vary from purveyor to purveyor.

Drought measures fall into two categories: those which increase supply and those which reduce demand. Development of new supplies, transfers through interconnections, curtailment of letdown requirements and use of reserves fall in the first category; restrictions on use fall in the second. Preparation of a multi-stage drought response plan is essential and will inform the public in advance of the measures to be taken during various levels of the drought. The plans should include rigorous but equitable restrictions and actions, specific to each purveyor, such as restrictions on non-essential water use, rationing and arrangements for emergency supplies. Use restrictions and other drought response activities would increase in severity as the drought intensifies.

DEP must take the initiative to develop such a plan in concert with local plans, and coordinate them on a regional basis for all areas of the State in coordination with other State agencies.

Emergency Response Plans (Non-Drought Related)

In addition to a drought, there are other crises or emergencies of a relatively sudden nature requiring immediate and rapid response. Power failures, source contamination, floods, main breaks, equipment failures and a wide range of other factors could result in a system's inability to supply water. Timely and efficient management of backup resources requires a plan of action based on preparation and coordination.

The State will require each purveyor to develop an initial emergency response plan to outline the actions necessary during a crisis. Each plan will identify relevant backup supplies and interconnections to be used. Since the reliabilities of many of the interconnections are as yet unconfirmed, the plans must be regarded as interim, to be updated after the interconnection testing program is complete.

The plans will include provisions for an annual update and must nominate an emergency response organization team of managerial, technical, operations and public information personnel. Although their size and composition will vary from purveyor to purveyor, all teams will need sufficient expertise and decision-making authority to respond quickly and intelligently to emergencies.

The specific elements and guidance criteria necessary for emergency response plans are detailed in Task 4E of the consultants' source material. The consultants' recommendations as outlined in source material Task 4E will be used as a guideline in developing the specific elements and guidance criteria necessary for the emergency response plans.

## Yield and Low Flow Analysis

The yield of any project development depends upon the inflow to and constraints on the watershed system. These are influenced by upstream and downstream uses, the hydrologic period selected for analysis and the pattern of supply and use. For surface water development projects, the project yield should be analyzed in terms of statistical reliability, using the full record of available hydrologic data as the period for analysis. Flows influenced by withdrawals must be corrected for purposes of such analysis.

The methods used by the Master Plan consultants are explained in Task 5A and Task B of the consultants' source material, listed in Appendix 4.

In areas subject to further urbanization processes, long range estimates may need to take account of the effects of projected increases in impervious surfaces due to development. The total annual surface runoff is almost always increased by such development; but the low flows are decreased, and variability between high and low flows will be much greater.

Interconnections between adjacent systems generally increase the total yield obtainable during times of drought from the two systems, viewed jointly, by reason of diversity in the occurrence of precipitation. This is over and above any increases in available supply due to joining a deficit area to one with a surplus. However, in estimating safe yield of an individual system, no reliance should be placed upon supply during drought from interconnected systems unless firm and legally binding arrangements are in effect.

The State of New Jersey has to take an entirely different viewpoint in estimating regional safe yield from interconnected systems, particularly the large purveyor network comprising Region 1. In this case the operations of individual systems, each to maximize its own safe yield, may not provide the optimal yield for the system as a whole. As an initial approach, planned operations of the individual systems may be accepted as a basis. However, the exact circumstances of the historical record drought by the region are highly unlikely to be repeated in a subsequent drought. By use of hindsight, a more effective systems operation approach can readily be devised, which would take advantage of diversity, and local shortages and surpluses occuring due to the particular drought circumstance. However it is by no means clear that an operation based on the circumstances of a particular drought would be equally productive in other droughts which may occur. To optimize results from a systems viewpoint, either synthetic hydrology must be used, providing a number of drought scenarios which are equally likely to occur, or some abbreviated method of operations analysis must be devised. It may be assumed that during future drought emergencies, as during the drought of 1980-81, purveyors will be required to operate for the good of the system as a whole rather than for each to maximize his own financial interest. However the extent to which such management controls should be imposed prior to an actual drought emergency remains to be developed through further analysis.

## Planning Information Storage and Update

Planning future resource development is significantly dependent upon today's actions, especially with regard to record keeping and data use storage. Because of the data's regional nature and the storage capabilities of the government computer facilities, the State should take the lead in this activity.

A bank of relevant information should be established and maintained by the Division of Water Resources for the combined use of all divisions of DEP, other interested departments and agencies at various governmental levels and the public. The data bank should be well organized and contain all relevant existing and new information computerized in traditional library form as appropriate to the specific type of information; be regularly up-dated; and be readily accessible to users.

A data base was developed in the study from four primary sources: diversion records; diversion permits and approvals; purveyor questionnaires; and Bureau of Potable Water inspection reports.

The consultants had computerized this information but the effort was limited to the base year of the study (1976 and preceeding records). Unfortunately, expanded or updated analysis of the data requires additional computer capabilities for any ongoing water supply management effort.

DEP needs to obtain additional computer software if accurate and effective watershed management plans are to be developed. A water budget is the basis for such plans and would account for the sources of various supplies and the extent of their use. The types of data which require processing include: comprehensive water resources inventory of all water sources and major facilities; water demand and projections; historical and projected population and employment; compilation of water supply allocations; water rights and diversions; compilation of potential water resource developments including the water resources bank projects; water supply regulatory and administrative requirements; compilation of existing and potential water supply programs together with their location; water supply emergency response plans; water conservation programs and results; and other information deemed necessary.

As an effective planning tool, this Statewide Water Supply Master Plan must be kept current and accurate. It can not be considered final at any time but rather should always be seen as a document suitable to revision as situations and technologies change. In order to accomplish this, it is proposed to have the Master Plan updated annually with a major revision every five years.

To assure this continued utility of the Water Supply Master Plan, annual progress hearings and five year major reviews and revisions of the Master Plan will be undertaken. As presented in the section entitled "Public Involvement in Water Supply Planning", quarterly meetings will be held throughout the State to address all water resources activities. The third quarter meetings will be the appropriate time to concentrate on water supply issues and the Master Plan update. At these meetings, the State will present its draft Master Plan update and solicit input from the public. The annual update will then be presented at the fourth quarter meeting. In addition to the annual update, at this meeting the Division will also issue a progress report and statement concerning major issues raised at the public meetings.

Every five years, as we begin to see substantial changes in the water supply situation and as we can evaluate the impacts of programs undertaken, the State will prepare a major revision to the Master Plan. Evaluation of the impacts of the activities proposed in this edition of the Master Plan will be undertaken and assumptions and projections presented will be revised as deemed appropriate. Public involvement will be sought in the preparation of the Plan as every effort is made to keep the Master Plan current and responsive to our water supply problems.

## Repayment

The current drought situation has arisen as a result of rainfall deficiencies which must be expected to occur periodically in any part of the country. However, states with much less rainfall than New Jersey succeed in assuring reliable supplies of water, and so should New Jersey. The acute effects of the current drought in New Jersey result from the fact that certain purveyors did not provide adequately for a dependable yield during times of extreme drought. Other purveyors, either more far-sighted or more fortunate in avoiding obstacles, have made safe yield provisions which are fully adequate. Obviously, purveyors in these very different situations, and their respective groups of customers, should not share equally in the costs of the new facilities, since certain areas which have already paid to build up a safe yield system should not have to pay a second time.

Considerable confusion and apprehension has subsequently arisen over this uncertainty as to financial responsibility for State developed projects.

Six concepts are considered important in deciding on the allocation of water supply costs for State financed systems.

(1) The main burden of cost should fall on those purveyors with the largest safe yield deficits.

(2) Purveyor systems which serve an increasing number of customers, while increasing their deficit, should pay more.

(3) The system should provide incentives for purveyors to decrease their deficits, either by increasing their dependable yield, or by divesting themselves of customers.

(4) Capital costs should be paid by purveyors every year on an annual basis; but operation and management costs should be charged based upon quantities for which water is contracted.

(5) The repayment system should be adjustable to future developments, as demand changes and as our drought experiences change.

(6) The State should assume the costs properly allocable to water quality. Costs allocatable to the State or purveyor for providing extra water supply as a margin of safety factor against droughts greater than have previously occurred will be determined for each specific project.

Above all, the State must resolve the current uncertainty as to how projects financed through statewide bond issues will be paid. In the future, purveyors who build additional water supply sources with their own financing or enter into long term contractural arrangements to purchase water from State facilities or those of other purveyors should be able to do so as an alternative to paying for the drought insurance aspects of State-provided facilities. If this is not done, there would be no logical reason for any purveyor to finance improvements or secure contractural arrangements in the future.

Methods of Charging for Drought Insurance:

There are three different approaches to charging purveyors for the costs of the drought insurance aspects of State-funded water facilities.

1. They could be charged the entire interest, amortization, and operation and maintenance costs of all facilities constructed. However, it is difficult to see how this could be done, since the State proposes to provide facilities which, for years to come will probably furnish firm water yield in excess of that which the purveyors are estimated to need.

2. They could be charged only for water actually used. This would not produce more than a small fraction of the revenue needed to amortize the investments. The municipal purveyors which have deficits need additional water only during specific periods, perhaps 10% of the time. There is no way that prices could be set so high as to amortize water facility investment on that basis.

3. The third approach is to charge purveyors every year an annual amount sufficient to amortize their proportionate share of the State's water investment in drought reserve capacity. In other words, a purveyor having an estimated reliable yield during severe drought which is 20 mgd less than the dependable yield required by the State, would pay amortization and interest costs proportionate to that 20 mgd deficit. If that purveyor's demand grew to a point where the deficit became 30 mgd, his charge would thereafter be proportionate to that increased deficit. This approach would leave the State to pay the costs not allocated to purveyors for payment. It is this approach which the State intends to follow.

Capital Costs Non-Reimbursable:

There are certain capital costs which would be non-reimbursable by the water purveyors, and would be more appropriately assumed by the State. For example, half of the output of the Raritan Passaic Diversion will be used for improvement of water quality, rather than to add to the supply of potable water. It would be difficult to determine the direct savings to a purveyor resulting from improved water quality. Water supply portions of the project would be paid back through a yearly charge in proportion to the benefits to each purveyor.

Any low flow augmentation project would be difficult to appropriate to individual purveyors since it is justifiable only to improve low flows. The need for such a project in the Delaware River Basin stems from obligations under an interstate compact; and its costs can hardly be allocated to specific water purveyors.

Other Regions:

The Manasquan Project costs should be charged to purveyors on the same basis as Spruce Run - Round Valley; cost should be reimbursed by the purveyors who purchase, treat and distribute the water.

Interconnections:

The costs of State-funded interconnections not otherwise reimbursed should be added to the capital costs of the State projects providing safe yield.

Temporary Projects:

The costs of any temporary projects for which arrangements to reimburse are not otherwise accomplished should be included in the above.

Based upon estimated demand growth by 1990, this total should grow to approximately 107 mgd by that time. The estimated demand in 1990 will be used as the basis to compute deficits.

If in 1982 the State should evaluate the total demand deficit of the Region 1 purveyors as 100 mgd and should provide 70 mgd of additional reliable safe yield through its permanent capital improvements, the purveyors with deficits would be charged with repayment of the capital costs of the State's improvements, divided proportionately based on their estimated deficits and anticipated reliance on the State supply. The purveyor deficits initially estimated will remain fixed for five years. If however, some of the purveyors combine to build the Wanaque South Project, with a yield of 64 mgd, the total safe yield addition of new projects would be 124 mgd (60 mgd supplied by the State and 64 mgd supplied by the purveyors' project). Those purveyors who had satisfied their safe yield needs by construction of Wanaque South would pay nothing of the State's capital costs. At the end of five years, the deficits will be recomputed on the basis of estimated demand for 1995 (ten years in the future). This recalculation will be done every five years thereafter. The purveyors responsible for the remaining deficit of 36 mgd would, though, be required to pay their appropirate percentage of the State's capital costs; and the State would assume the remaining cost, until demand increased or some other circumstances occured to require use of the State's supplies. The percentage would be calculated as follows:

$$\frac{\text{Purveyor Deficit}}{\text{Safe Yield Provided}} \times \text{Project Cost} = \text{Purveyor Cost}$$

## Watershed and Aquifer Protection

The water supply programs proposed so far in this report; conservation, water supply projects and improved allocation practices, will enable the State to satisfy existing and projected deficits for some time to come. These measures alone though, are not sufficient to adequately protect the quality and long term availability of the State's water supply. Ultimately we must all realize that the continued availability of adequate and safe water supplies for future generations will require implementation and enforcement of sound land policies. Despite existing wastewater control programs, increasing urbanization of our State threatens water quality and supply by infiltration from solid and liquid wastes, by storm runoff from urban and developing areas and also, to some undetermined extent, by acid rainfall resulting from incomplete control of activities outside the realm of State authority.

A comprehensive water supply plan must incorporate a plan of action to safeguard water supplies in the natural drainage basins of the State and in storage reservoirs both above and below ground. This will insure that all water supplies, whether provided by water purveyors or obtained directly from these sources, as are agricultural withdrawals and private residential, industrial and commercial withdrawals, can be protected.

It does not appear that within the next few years the Federal government policy will provide much direct support for these programs designed to safeguard potable water. Accordingly, more responsibility will rest upon the State and the various sub-state entities.

A watershed and aquifer protection program is indispensable to the long run success of the water supply plan, and it will be developed as a major objective over the next five years. This will require more understanding of the processes involved, more cooperation among State agencies having land use responsibilities, more help from the Federal government in funding research, new State legislation to authorize some part of the program and, certainly, the active assistance of counties and municipalities as they apply their land use powers in urban and urbanizing areas. The Department intends to develop such an integrated program. (The initial phases are presented later in this section.)

There is no complete technology either in theory or in practice for a program of this nature. A more complete watershed and aquifer protection program must be developed with care. For example, it would be grossly uneconomic to fund advanced waste treatment at waste disposal plants in watershed areas in order to remove objectional pollutants, and simultaneously to require industrial or commercial controls in the same watersheds to remove the same pollutants from water treatment plants downstream. It is essential that we thoroughly examine all existing programs and authorities to determine how best to carry out the goals of potable source protection in a multifaceted approach to water quality protection.

There is a general deficiency of information as to the extent of pollution of the waters of small streams, which occurs largely during storm runoff, and is not susceptible to monitoring by regular gauging stations. There is an even greater deficiency of information as to the exact paths of travel of subsurface waters and the pathways by which pollution reaches aquifers. However, in both cases we know where the watersheds are, and also (although with less precision) where the aquifer recharge areas are. Together they cover the greater part of the State. The main danger which they must be protected against is pollution; and this pollution originates in man's activities. Surface waters, in addition to pollution, must also be protected against types of land development which accentuate floods and channel erosion, and destroy environmental and recreational values of stream corridors. In addition, additional dangers result from activities which restrain sufficient recharge of the water supply systems.

Components of this watershed and aquifer protection program may generally be classified as either remedial or preventive. Remedial alternatives are generally expensive. They may include treatment of dangerously contaminated storm sewers and streams, coping with pollutants at water treatment plants by means of activated carbon treatment, ozonation to replace chlorination, or both, and removing or sealing off important sources of groundwater contamination.

Preventive programs may include regulatory or zoning restrictions on the use of potentially hazardous materials, prohibitions on their use entirely in certain areas, control of solid and liquid waste disposal systems at the smaller commercial and industrial facilities, and improved storm water management systems, which settle out the pollutants in dual purpose detention basins, or remove them by vacuum street sweeping. They also include control of water allocation programs in such a manner as to minimize saline intrusion and groundwater contamination.

An important kind of preventive alternative is the control of land use to assure compatability of land use with the need to protect watershed requirements. The combination of the new water supply projects, conservation measures, and improved capabilities for effectively allocating and distributing available water supplies will enable the State to erase existing and projected deficits for the immediate future. However, the availability of adequate water supplies for future generations will require sound land use policies. Preventive measures may include proper control on all watershed lands owned by a water supply entity, inland wetlands protection and headwaters protection, as well as the purchase of development rights or fee title directed towards discouraging or prohibiting pollution prone types of development in watersheds and recharge areas. Land use control and control of waste disposal are particularly important adjacent to well heads.

Due to the great complexities and uncertainties of the subject, the Department will require five (5) years to prepare a full comprehensive watershed and aquifer protection program, giving proper recognition of the role played by local and county governments, as well as Federal agencies.

A program for the first two (2) years will include the following.

a. Give priority to enforcement actions against activities which impact on surface and groundwater supplies.

b. Promulgate a State policy and regulations for a storm water management program incorporating quality as well as quantity considerations. Seek funds to make the authorized planning grants, and request the legislative strengthening of this law to make its application mandatory.

c. Include in water allocation rules and regulations a requirement for consideration of stressed aquifers and discouraging juxtaposition of wells to known sources of pollution.

d. Begin to develop a headwater protection strategy utilizing permits and regulations as appropriate.

e. Initiate a program of analysis and corrective measures for groundwater contamination and saltwater intrusion in key areas.

f. Initiate a study report for chlorination/ozonation/activated carbon water treatment measures in critical watersheds.

g. Initiate a demonstration project for a county level water resource management program to monitor, educate users about, and enforce measures to:

   1. ensure long term care of septic systems
   2. ensure maintenance of storm water detention basins
   3. ensure control of runoff of pollution at the site
   4. safeguard aquifer recharge areas and wellheads from pollution.

   The role of the County Environmental Health Act in water resources management will be examined.

h. Seek improved authority to protect wellheads from pollution, both existing and future.

i. Develop a methodology to define critical recharge areas with the awareness that delineation of an aquifer outcrop area does not necessarily adequately define aquifer recharge areas.

## Conservation

Most people have come to consider their water supply as automatic and constant. Only during a drought or as a result of atrocious contamination do we begin to realize and appreciate our dependancy on and expectation for a sufficient supply of potable water on demand.

In this regard, the State plans to work to assure development of additional supplies to meet the total estimated needs. However, this planning practice does not in any way obviate the need to investigate, encourage, support and work to insure sound water conservation practices throughout the State. Although demand projections in this Master Plan do not include a projected factor for conservation it is nevertheless important that the effects of conservation be closely monitored and demand projection updates be adjusted accordingly. The Department of Environmental Protection's future water resource management activities must include a program that assures the wise use of water through implementation of a conservation program and development of a conservation ethic as an understood part of our society. The State must take the initiative to educate citizens of New Jersey on how they can individually and collectively benefit from water conservation programs.

When any governmental unit begins its conservation planning, it must first determine what the goals of the conservation program are and whether these goals can be met through "supply management", "demand management", or a combination of both. Supply management programs include the general elements of water source development and protection, collection, treatment and distribution. Conservation aspects of supply management programs include practices such as source protection, metering, leak detection and repair, system rehabilitation, and pressure reduction which all serve to maximize efficient use of the resource. Significant decrease in consumptive use relating to correcting existing deficiencies is a sound water supply management practice.

The advantages of a sound supply management conservation program include:

1. Improved efficiency can result in a long term reduction in use and therefore serve to assist in closing the gap between a systems demand and its dependable yield, a gap which exists with many of New Jersey's purveyors.

2. Associated activities are not dependent on an individual customer's commitment to conserve and therefore savings are more predictable and dependable.

3. The water that is "saved" can in turn be distributed and used for other purpose.

The major disadvantage to supply management conservation programs is the initial cost. Generally, programs to increase system efficiency involve significant expenditure of funds. Leak detection programs involving a scan of a system using listening techniques could cost from $5,000 to $10,000 per year for a community of 15,000 people. Repair costs will also vary depending on the location, size and type of repair. Yet the cost of repair is more than absorbed because of increased resources available due to the improvements to system efficiency.

Before any project is developed, it is essential for determinations be made on whether or not the water losses are significant enough to justify the expenditure.

There is no question that sound, efficient business practices applied by all purveyors of water will result in substantial water savings and may postpone, and possibly in some cases eliminate, the need for development of additional sources. To the extent that they are cost effective, such programs are advantageous for purveyors to adopt.

Demand management includes any action which decreases the consumer need for water. Demand management programs include such elements as changes in pricing schemes to encourage less use; regulations and incentives which require or induce conservation practices; and extensive education and awareness programs designed to develop in the minds of the consumer an understanding and instinctual commitment to water conservation.

Demand management techniques can be looked at as either permanent structural water conservation efforts (low flow plumbing fixtures, flow restrictors, etc.) or behavioral water conservation practices. Through the use of modern water conserving appliances and retrofitting devices, water consumption can be reduced with no appreciable change in the behavior of the consumers. The consumer does not generally care how much water is needed to provide a specific result as long as the result is satisfactory.

During emergencies and times of severe supply shortages, additional savings can be realized through specific behavioral changes. Reduction in lawn sprinkling, limit on timing of showers, and other similar changes in a consumers' behavior are measures which are most appropriate to emergency situations where individuals can be called upon to inconvenience themselves for a short term.

Advantages of demand management programs, either permanent, structural changes or short term behavioral changes include their versatility, general inexpense (when compared to supply management techniques) and relative ease and speed of implementation.

Reduced usage during periods of normal precipitation will result in decreased revenues for the water companies. Care must be taken with any water conservation program to ensure a sufficient rate of return for the purveyor to assure them the ability to maintain their systems and assure future safe yields. Economic advantages of water conservation practices will be most prevalent with reduced cost in other areas, e.g., energy costs to heat and transfer water and possibly decreased tax dollars necessary for waste treatment.

Another aspect of conservation efforts, which would involve a combination of supply and demand management, relates to the coordination of existing regulatory programs to enable the application of existing authorities to encourage water conservation practices.

In order to insure effective conservation practices throughout the State, the Department of Environmental Protection will develop an Office of Water Conservation as an office in the Department's Division of Water Resources.

As the office develops its water conservation program it will certainly include aspects of both supply and demand management and where appropriate, pursue this through regulatory programs. At a minimum, the following items are to be considered as components of the comprehensive strategy:

1. Enforcement of the New Jersey State Uniform Construction Code which currently requires installation of water saving devices in all new construction. The DEP will encourage the DCA to verify the extent of compliance to date and whenever compliance is inadequate will work with the DCA to improve effectiveness of the Code.

2. Encourage application of the findings of the 18-month Stevens Institute research study, funded by the Division of Water Resources, to investigate the effectiveness and performance of certain residential plumbing devices. In addition, establish a program for retrofit conservation devices where applicable and effective.

3. Thoroughly investigate financial policies such as pricing mechanisms, tax incentives and other inducements which may encourage conservation practices.

   Consumption has increased as our standard of living has improved due in part to some of the luxuries currently enjoyed (e.g. dishwashers, washing machines, swimming pools, air conditioners) which are not water efficient and use large quantities of water. This escalating per capita consumption rate puts additional demand on, in some cases, already overtaxed water systems. A program of economic incentives to control water use may be an effective approach in reducing demand.

4. Investigate and create an awareness of water efficiency ratings for various appliances.

5. Expand efforts in the area of leak detection, and repair and rehabilitation of water supply distribution systems. Analysis of data provided by the purveyors shows levels of "unaccounted for" water from 10% to 50%. Even a "tight system" can lose up to 12% of its water. The State needs an aggressive leak detection program to accurately document the situation. The charging of capital costs to the purveyors in proportion to calculated deficits will provide an additional incentive to repair antiquated and inefficient systems. State loans and grants may be provided to the extent that funds are available. When a purveyor seeks an increase in his allocation, he must first be required to prove that only a minimal amount of water is being lost in the system.

6. The Division should encourage and assist in industrial conservation technology transfer. Besides evaluating industrial practices designed to reduce process water needs, these efforts can also include investigation of cooperative agreements between industries to enable innovative reuse programs. The Office of Water Conservation will be in the best position to provide the outside stimulus and coordinating mechanism for efficient reuse activities.

7. The Department of Environmental Protection must devote resources to the development of a "conservation ethic" in New Jersey whereby all residents of the State begin to utilize potable water as a precious resource. The recent drought which impacted the northern part of New Jersey forced people in the area to increase their awareness of the importance of water. Southern and coastal New Jersey, while not as susceptible to the short term impacts of average and below average precipitation, must still recognize the serious threat of contamination and saltwater intrusion. Where "mining" of aquifers is concerned, water is not a renewable resource, and water conservation is essential at all times. In order to encourage the development of this "conservation ethic" a creative, extensive public awareness program should be pursued. The 3323 schools in New Jersey should be brought into these efforts. By educating the youth of New Jersey we are able to challenge and change attitudes early. Permanent water saving practices that do not significantly impact life styles should be encouraged and made available as cheaply as possible. For example, low flow showerheads, after simple installation, continue to function with little noticeable change and do not require a constant awareness on the part of the consumer.

8. Utilize all available regulatory authority to encourage sound conservation practices. Thoroughly examine existing programs to determine all opportunities to carry out this goal. For example, the Clean Water Act of 1977 provides for the planning and construction of publicly owned sewage treatment facilities to meet the legislative mandates of the Act. Part of the criteria for determining grant eligibility requires evaluation of systems employing the reuse of wastewater and recycling of pollutants as waste management techniques. Other aspects of the analysis requires, in most circumstances, an evaluation of the costs, cost savings and effects of flow reduction measures. Measures to be evaluated include public education, pricing and regulatory approaches, installation of water meters, retrofitting of toilet dams and low flow showerheads, changes in local ordinances and plumbing codes and development and implementation of a flow reduction program. Since these "Facilities Plans" are also required to include an assessment of primary and secondary impacts, the projects impact on surface water and groundwater quality and quantity must also be evaluated. The Department of Environmental Protection must strengthen this aspect of Facilities Planning to be coordinated with its watershed protection strategy. In addition, the Federal guidelines allow for an additional 10% Federal funding for innovative and alternative technologies with respect to meeting a national goal of greater recycling and reuse.

9. After thorough examination of existing applicable State legislation and regulatory programs, recommend, develop and implement any additional legislation/regulations deemed necessary to promote sound and continuing water conservation practices.

10. Evaluate innovative water use/waste water disposal practices in all consumer categories and promote and strive for public acceptance of same where feasible.

11. Work to assure that in the development of State regulations, every opportunity to incorporate conservation concerns is realized.

## Special Water Treatment Problems

Since many of New Jersey's raw water supplies contain appreciable concentrations of hydrocarbons and other pollutants, the use of chlorine for disinfection of water supplies poses a potential hazard. It is possible that toxic or carcinogenic substances may be created by the treatment processes themselves. In Europe, ozonation is often used instead of chlorination to avoid such dangers; but this has rarely been done in the United States. Instead, processes of activated carbon treatment are being increasingly suggested to remove undesirable residuals. A great deal of research is underway on these alternatives; but the application of research results to particular situations will require much more information. In order to provide a sounder basis for management decisions regarding treatment processes on rivers of marginal water quality, a major effort is required to obtain and analyze recent research results and investigate the technology of applying improved treatment processes to New Jersey's rivers.

## TABLE 6

## ACTION PROGRAM 1981 - 85

| Feasible for Early Implementation by State | Estimated Costs ($ million) |
|---|---|
| High priority rehabilitation and consolidation of inadequate water supply systems | 65 |
| Interconnection testing and priority improvements, including Great Notch and New Brunswick-South River area | |
| Delaware and Raritan Canal Improvements | 20 |
| Manasquan Reservoirs | 40 |
| Additional water for Northeast Region (Raritan Passaic Conveyance system)* | 65 |
| Conservation Program | 1** |
| Watershed and Aquifer Protection including groundwater | 154** |
| Special Water Treatment Study | 0.5** |
| Feasibility studies for additional water supply projects (including but not limited to:) | |
| Conjunctive use south River Area | |
| Dunkers Pond | |
| Evaluation of contaminated well fields and alternative supplies | |
| Hudson and Delaware main stem projects | |
| Lawrence Brook Chain of Lakes restoration | |
| Longwood Valley | |
| Low flow augmentation Delaware River | |
| Monksville | |
| Raritan Confluence | |
| Six Mile Run | |
| Washington Valley | |
| Water supply for Camden Metropolitan Area | 20 |
| **Feasible for Early Implementation by Others** | |
| Wanaque South | 90*** |
| Merill Creek | 100**** |
| **Other Projects Proposed for Funding but Scope and Cost Needs Additional Work** | |
| Water supply for Camden Metropolitan Area, Recharge and Conjunctive Use South River Area and Ground Water Investigation and development | |
| Additional supply projects recommended by feasibility studies | |
| Other rehabilitation and consolidation of inadequate water supply systems (total cost estimated $330 million) | |
| Total proposed to be funded under 1981 Water Supply Bond Issue | 350 |

* Based on current cost comparison within alternative projects. Further evaluations underway.

** Exclusive of staff and administrative costs.

*** Planned to be built by purveyors. Cost given is without treatment plants.

**** Planned for construction by Electric Utilities--Some State participation under investigation.

## Actions Between 1985-2020

Once the immediate action program is underway, the State and purveyors will be in better position to consider and respond to needs that will develop after 1985. State water needs over and above existing supplies are expected to grow by some 258 mgd between 1980 and 2020, as shown in Table 1. The effective utilization of available resources within this time frame and thereafter will be enhanced by the management issues adopted as a result of the Water Supply Master Plan.

Development of new sources of supply will remain the principal means of satisfying needs in the 1985-2020 period. Attention will be given to the impacts of water conservation practices on demand forecasts and the effect of these programs should be monitored closely for their potential impact on local needs and future project construction schedules.

The consultants, in their Summary of Findings, had prescribed several specific projects for the express purpose of meeting future water supply needs. DEP considers their evaluation and their subsequent recommendations as valid in so far as the information was available to review the numerous water supply projects proposed for the State, but feels that additional work is necessary to commit absolute support for their development.

In selecting the long term projects recommended in their report, the consultants had screened more than one hundred twenty five water supply projects which were proposed or conceived of over a long period of time. Many projects were disqualified for a number of obvious reasons, which left some twenty-four preferred projects for detailed evaluation and ultimate recommendation in the Summary. Several of the projects on this list were discussed and recommended in preceeding sections for immediate implementation. We, feel however, that the available information on the remaining projects in the list was deficient and additional evaluation of the long term recommendations is required.

In order to maintain flexibility in the planning process, we recommend that this list of projects in the "project bank" (established as a result of the consultants' efforts in Task 3D) be studied in greater detail. This additional work can easily be accomplished as part of the environmental review process for the projects currently identified for immediate action. The review must consider all feasible alternatives to the proposed project. In this manner, we will indirectly fill the data gaps that exist in the project bank.

The remaining projects that were identified by the consultants in the list of preferred alternatives are:

Region 1:

Confluence Reservoir, Pump Station and Force Main
Hackensack River Optimization

Longwood Valley Reservoirs
Monksville Reservoir and Ramapo Pump Station
Raritan-North Branch Pipeline
Raritan-Northeast Pipeline (Purveyor Reinforcement)
Raritan-Passaic Pipeline (South Route)
Round Valley Reservoir Expansion
Six Mile Run Reservoir
Washington Valley Reservoir

Region 2:

Explore additional groundwater options in areas beyond the reaches of the Manasquan Project*

Region 3:

Local Groundwater Projects As Required

Region 4:

Local Groundwater Projects As Required

Region 5:

Delanco Intake
Philadelphia-Camden Pipeline
Wharton Tract Southwest Groundwater

Region 6:

Beaver Run Reservoir
Franklin Reservoir
Groundwater Supplies*
Hackettstown Reservoir
Honey Run*
Petersburg Reservoir
Ross' Corner Reservoir
Shades Reservoir
Sussex North Reservoir

As conditions change and as needs develop, DEP will be in a better position to judge these projects five years hence, concurrent with the completion of the projects recommended for immediate contruction. Although they were not included in this list by the consultants, both the Tocks Island Lake Project and the Hudson River diversion will continue to be evaluated. This evaluation must include revised cost estimates, growth projections, and costs of delivery systems.

Several water supply facilities have been considered in recent years by various local purveyors and governmental agencies, several of which are listed above in the project bank. DEP will support these local efforts and only take action where necessary to facilitate supply development in these areas when local purveyors and governments are not able to assume the responsibility.

---

* Added by DEP

## Governmental Proposals and Recommendations

After a careful evaluation of the present governmental system for managing water supply, specific adjustments to this system are obviously necessary. In a general sense, they are discussed here to serve as an introduction to the specific governmental actions being proposed and/or implemented by the State.

### 1. PROPOSED NEW DIVERSION LAW: SYSTEMATIC RECORDING OF ALL WATER RIGHTS.

There has been an absence of certainty over people's rights to use water and a lack of knowledge of the quantity of water that can be used. As a result of allocations emanating from special legislation, from grandfather consideration, and from permits and approvals, there is a basic difficulty in managing water resources in New Jersey. The conditions of the allocations are not always readily determinable.

For these reasons, the new diversion law recently passed by the legislature proceeds on the principle that a right to use water may be limited in the public interest, provided that the regulation is reasonable and that it is applied equitably.

A primary function of the new law is to precipitate the declaration and confirmation of all existing water allocations with a statutory mandate directing everyone to have validated and recorded their claimed water rights. An objective of the law is the orderly and complete recording of water allocations, so that all may know the nature and extent of outstanding rights to withdraw or divert water. Where a claim is disputed the State would need to determine the existence and extent of the right. Judicial review should be available for claimants who are not satisfied with the administrative findings.

It is the State's intent to establish a confirmed and systematic recording of all water allocations and to formulate the legal underpinning of an administrative water resources management system.

### 2. REVISED ADMINISTRATIVE REVIEW PROCESS: TIMELY AND DECISIVE DECISION-MAKING

Although an overwhelming number of water supply allocation applications have been handled in a timely and objective manner, in exceptionally critical and complicated hearings and cases the decision-making process has not always functioned smoothly.

In these cases, the difficulties with the existing regulatory system as well as the limited planning perspectives have slowed the implementation of needed major projects.

Changes are therefore necessary to the organizational structure for the water supply hearing process. In addition, the development of a planning base for the State review of applications is necessary.

## 3. ALL PURVEYOR SYSTEMS: TO BE OPERATED AS UTILITIES

The future of the State's water system has been premised on the ability of the water purveyors to finance, construct, and operate their own system, and to fulfill their responsibilities. To accomplish this objective, it is necessary that all purveyor systems - both public and private - are operated in a sound financial and businesslike manner. Public purveyors in particular must function on a self-liquidating basis.

The accounting and administrative review processes and procedures are already in existence. Requiring adherence to a self-sustaining principle should not require manpower changes. Under revised statutes, all municipally operated water utility financial information must be identified in a separate division of accounts. The municipally operated water utility must comply with the State's regular audit procedures and have such audits prepared by a registered municipal accountant. Similar requirements are mandated for private water companies which are required to submit annual financial reports to the State.

It is incumbent upon the private and municipal systems to follow the long standing rate-making principles of the American Water Works Association or the Joint Committee in developing rates for self-sustaining operations. Equally, it is incumbent upon the State through the BPU, the DEP, and the DCA, to oversee the performance of the purveyors, to make sure that these principles are applied. DEP must assist by verifying that utility systems are committing the necessary resources to maintain and improve their systems including, for example, developing or arranging for sufficient supplies for normal operations and emergencies; testing interconnections to verify condition and flow capacity; maintenance and improvements to distribution systems; maintaining current emergency and drought response plans.

## 4. STATE WATER UTILITY OPERATIONS: ON A SELF-SUSTAINING UTILITY BASIS

The State government should serve as an exemplary model for all utilities, in particular the public purveyors. As such, it is imperative that the State-owned water operations be based on the same self-sustaining utility management principles as described above.

The statutes were recently changed so that the financial management of the State's water supply facilities will be similar to that of a commercially operated water utility.

Under this system, revenues from the water operation of the Delaware and Raritan Canal as well as those from the Spruce Run/Round Valley Reservoir Complex, would be paid towards all operating and maintenance expenses of its facilities, as well as bond retirement and interest on bonds outstanding. Approved rates should be set at levels sufficient to cover all costs and leave adequate reserves, except for the cost of drought storage. Consequently, it would not be necessary for the State to make budget appropriations from the General State Fund to cover operating and maintenance costs. The State, however, should pay the bond indebtedness of the water stored in these projects for drought emergency. As these drought reserves are committed, the financial responsibilities would shift to the users. Moreover, dedicating certain revenues to specific purposes, is both legally permissible and in full conformance with the practices of the Legislature and the State Treasury.

## 5. THE SMALL WATER COMPANIES: THE COMPANIES AND MUNICIPALITIES MUST MEET THEIR RESPONSIBILITIES

Just as the State and the purveyors must assume responsibility for their programs and operations, so also must local governments meet their responsibility and recognize their paramount decision-making role in franchising small water companies. Before any efforts to render financial assistance to small water companies are instituted on a Statewide basis, it is first necessary to clearly assign responsibility and to mitigate the recurrence of this problem.

In reviewing the experiences of the small water companies, the trend has been that in the early stages of their development the municipality does not deem it in its interest to assume responsibility for the provision of water, and it grants its consent to private water companies, frequently incorporated by developers or builders to provide the service. As time goes by, problems with the reliability of the service and management are encountered.

In determining whether to grant a franchise to a water company, the municipality's consent is the primary determinant. The Court has held that the State Board of Public Utilities lacks the power to dispense with local consent, and that the State agency cannot override a municipal refusal to grant a franchise to a water company.

Small water companies are primarily a local problem, and it should be addressed by those entitled which have primary responsibility for approving the systems. Local government must fulfill those responsibilities that are based on the success of home rule. Also, it should be understood that some small private water companies are sufficiently financed, well managed, and adequately equipped. Under such conditions, small water companies should not be discouraged. The small water company has an extremely important role to perform, and where properly constituted, can be very successful. However, if the small water company is unable to fulfill its responsibilities, the municipality that approved the franchise must be prepared with an alternate plan and approach to assure safe, adequate water for its residents.

## 6. THE LARGE INVESTOR-OWNED SYSTEMS: THEIR ROLE MUST BE MAINTAINED AND STRENGTHENED

The competitive posture of the large investor-owned water utilities must be maintained and strengthened because of their unique role in New Jersey. Research has indicated that the major investor-owned water systems have a strong record of reliability and public responsibility, and are willing to reinvest in their systems.

The State should support only those financial measures that will strengthen the ability of all water utilities to be self-sustained, businesslike operations. One such measure is for the State to institute a Pool Fund Concept to provide money for financing improvements by the large investor-owned systems and selected small private water companies worthy of assistance.

The advantages of pursuing the Pool Fund Concept approach for private water purveyors in New Jersey could be extremely significant.

Of a policy nature, the Pool Fund Concept would integrate the primary State departments and agencies in the decision-making process. Under the proposal the Department of Environmental Protection (DEP) would exercise responsibility for identifying and evaluating the technical and capital needs of the purveyors in accordance with sound water quality and quality considerations; the Economic Development Authority (EDA) would exercise responsibility for developing and implementing a financial revenue program that is responsive to the needs of the identified purveyors and to the concerns of the financial community; and the Board of Public Utilities (BPU) would exercise responsibility for monitoring and strengthening the revenue-tariff (rate) relationship in an expedited and understood manner that would address the needs of the purveyors and their customers.

On the financial side, the Pool Fund Concept would enable the State to package the large "A" rated companies and the nonrated companies in a manner that would meet the financial needs of both the large and the small purveyors concurrently. The small private purveyors who are not capable of financing long-term investments on their own would be the greatest beneficiaries. Most significantly, the Pool Fund Concept would maximize the opportunities of the private sector money market while not impairing the full faith and credit of the State.

Under the proposal, the active participaton of the private sector should serve to institute a "businesslike review" and promote a proper complementary mix of the private and public sector values. Also, all of the private purveyors would be able to participate in the program, and the revolving nature of the fund and the experience and capabilities of EDA would minimize uncertainty and costly processing time.

## 7. STATE ROLES IN WATER SUPPLY: TO MAKE SURE WHAT SHOULD BE DONE IS ACCOMPLISHED

A thorough and well balanced program of water management and development throughout the State is essential to assure readiness and to obtain and utilize water efficiently, and to see that distribution and entitlement to use are equitably provided. It is incumbent upon State government to make sure that such a program is instituted and maintained. It is also appropriate for the State to make sure that public and private purveyors use available resources so as to meet the legitimate needs of the region as well as their individual interests.

Although there are many roles that the State can and could play in the water supply management field, the State intends to limit its direct participation in areas where, more appropriately, purveyors and municipalities should fulfill the responsibility.

Basically, it is the primary responsibility of the purveyor and municipality to provide an adequate supply of potable water and it is the State's responsibility to see to it that this is attained in a coordinated and planned manner.

The State's responsibilities and roles in the water supply area may be viewed from many perspectives. However, fundamentally there are seven significant areas -- policy, trustee, guardian, economic welfare, management, overseer, and utility operator. The nature of those roles is identified as follows:

- The State's policy responsibility to establish the overall water supply management framework and statutory basis, to institute the technical standards and enforcement procedures, and to sustain the required monitoring, research, laboratory and training efforts and programs;
- The State's trustee responsibility to regulate and to allocate, the use of water resources in an equitable manner, and to determine the water resources that are needed and that are available for use;

- The State's guardian responsibility to assure potable water quality, to conserve the judicious use of the water resources, and to establish uniform action plans for droughts and emergencies, including safeguarding environmental low flows;
- The State's economic welfare responsibility to promote and to develop the welfare of its citizens and its industries and to see that their legitimate social and economic water needs are realized by purveyors and municipalities;
- The State's management responsibility to establish a sound institutional and financial water supply system, to ensure the continued health of the private purveyors, and to direct its programs on a self-supporting basis;
- The State's overseer responsibility to support the planning, coordination and public participation required for the protection and maintenance of its intrastate and interstate water resources; and
- The State's utility operator responsibility to conduct its activities as a wholesaler of water in an exemplary fashion, and to operate the State facilities on a self-sustaining basis.

In summary, the State accepts the responsibility to make sure that the purveyors furnish adequate supply of readily available, safe drinking water for the health and economic well-being of its citizens, communities, commerce, and industries.

## 8. STATE WATER SUPPLY PROGRAMS: ON A SELF-SUSTAINING BASIS

The State's administrative, management, regulatory and planning operations should be based on a self-sustaining approach. The development of revenue sources to cover the variety of prudent and necessary functions performed by the State DEP in the water supply field should lead to the establishment of a self-sufficient water supply management system.

The principle of water fees to cover the costs of the administrative, management, regulatory, and planning programs is not new to the water supply program in New Jersey. The 1907 enabling legislation for State responsibility in the area of water supply included two fee provisions which were intended to make the program of a self-liquidating nature.

However, since that time, the needs of the State, the demands for regulation, and the conditions of the economy have changed dramatically without a commensurate alteration in the amounts of revenue which the fees generate. As a result, the water supply program has relied upon the State and Federal tax revenues to a greater degree as the program has expanded over the intervening seven decades.

## 9. BUILDING A WORKING PARTNERSHIP: GOVERNMENT MUST INCREASE PRODUCTIVITY FROM EXISTING RESOURCES AND MOVE TOWARDS ADMINISTRATIVE COORDINATION

State government's resources are limited. There is a strong competition occurring among the State, county and municipal programs for those limited resources, and resources have not grown at a rate commensurate with the expansion of government's regulatory responsibilities. Consequently, a far greater return and increased productivity will have to be gained from existing resources.

For example, the State is now responsible for carrying out the Safe Drinking Water Act activities, and seeing to it that all available resources are drawn upon to accomplish the purpose of this Federal Act. In recognition of resource limitations, the cooperative approach, which utilizes county and local resources, appears to be the only way in which the potable water quality program can be applied on a widespread and relatively uniform basis. In this approach, the State sets policy and monitors progress but leaves actual implementation to lower levels of government. Experience indicates that potable water quality regulations can be carried out most effectively by those close to the regulated water supplies, and this is the principle that should be employed within New Jersey.

The cooperative approach needs to be developed to utilize the existing resources of other governmental units, particularly those of county governments. Implementing the County Environmental Health Act would serve to reforge an old alliance and establish a basis for much needed localized action for potable water quality regulations.

Moreover, a similar approach can also be selectively applied to the groundwater quality management program, field activities of a laboratory, monitoring and surveillance nature, and technical assistance and planning type activities.

A working partnership approach should be utilized between agencies. Particularly between the DEP's Division of Water Resources (DWR) and the Board of Public Utilities (BPU). There must be improved orchestration between the DWR and the BPU on rate cases and water supply issues. Opinions expressed during interviews and the public participation process were that the DWR should not assume the power to determine water rates. The formulation of an inter-agency (DWR-BPU) policy agreement, and continuous and ongoing staff coordination on service, engineering, financial, and inspection matters should result in an expedited, less costly, more effective process.

The working partnership approach and administrative coordination should also be instituted: 1) between DEP and EDA on financing the needs of the private sector; 2) between DEP and DCA in assuring that the municipal purveyors are committing the appropriate financial resources to maintain their systems in a utility operations manner and 3) between DEP (as the State representative) and the Delaware River Basin Commission and the States of New York, Pennsylvania and Delaware in developing the necessary strategies and programs to ensure the maximum use of the interstate waters.

Clearly, the primary role of State government - namely, to make sure that what should be done is accomplished - emerges from this emphasis on administrative coordination and making greater use of existing resources. The State will avoid assuming direct control of purveyor operation except to the extent that is clearly essential to achieve a public objective.

## 10. THE ROLE OF STATE CAPITAL: A PRUDENT ALLOCATION OF LOANS AND STATE FINANCING

The utility concept, as applied to water supply, should not be eroded, either consciously or unconsciously. Unfortunately, Federal and State grants have a tendency to create a dependency relationship, and such an arrangement is not beneficial to the long-term interests of the purveyors and their customers. Furthermore, Federal and State grants in a utility area can serve to disguise the cost of service, diminish local responsibility to be self-sustaining and develop inequitable rates. When public purveyors receive grants, another public purveyor (or more importantly a private purveyor which may not qualify for the grant) will have commensurately higher charges. As a matter of policy, the financial opportunities that are available to the public purveyor must not undermine self-reliance, or the eventual repayment by user charges, or the public-private balance in the State.

## 11. STATE-SPONSORED PROJECTS

It is recognized that the State has basic responsibilities in the water supply field and that there are appropriate occasions when it is incumbent upon the State to use its financial resources for the best interests of its citizens and for the health, welfare, and economy of the State.

Understandably, there should be compelling reasons for the use of State capital. The reasons should reflect the considerations that have been identified: multiple use projects of a regional nature; projects where it is not possible for private capital or localized public capital to be raised to meet the intended objectives; and projects which, if not fulfilled, will cause society as a whole to suffer negative repercussions. Obviously, decisions for State financing should be based on the individual merits of the project.

Some facilities should be financially supported as a matter of State policy, as a form of protection for the benefit of the public or to provide for long range future needs or for drought reserves. The State would initially fund the requirements, and when demand for the water increases to the point where the facilities are required to provide water to meet the demand, the costs of such facilities should be transferred to regular operating accounts.

## Management Changes

As the consultants' research showed and subsequent drought experience confirmed, major changes in the governmental system for managing water supply are necessary if New Jersey expects to reach its goals of resource management. Development of an effective management system with clearly defined roles for all levels of government and the private sector, based on a system of protected and documented rights is the goal of the State water supply program.

In light of additional public input and the realities of the current drought, the State Legislature has enacted legislation designed to provide the State with the critical tools necessary to do the job. These proposals were subjected to extensive public scrutiny and legislative review occurring simultaneously with the development of this plan. The resulting legislation constitutes the basis and framework of its water supply programs in the future.

Appendix 2 includes the most recent legislation. The remainder of this section discusses the major governmental programs the State considers essential in order to bring the management of its water supply into compliance with State goals.

## Water Resources Management Act

Water resources of the State are essential to the health, safety, economic and general welfare as well as the esthetic and recreational enjoyment of all people in New Jersey. As trustee of this vital resource, the State must ensure that an adequate supply of good quality water be available for all people in the State. Although New Jersey generally receives large quantities of precipitation each year (approximately 42 inches - compared to 12 inches in Colorado for example) often the water is not available naturally in the areas of need. Unfortunately, we are seeing serious contamination of our water resulting in some supplies being unacceptable for human use. The existing allocation system and the history of legislative grant and grandfathering of rights has, in effect, hindered the State's ability to manage this resource on a sound technical basis.

In order to ensure an adequate and safe supply of water for citizens of the State, it is necessary that the State, through the Department of Environmental Protection, have the power to manage the water supply in a comprehensive fashion which recognizes the specific role of all regional county and local units.

This responsibility rested with the Water Policy and Supply Council (WP&SC). As described in earlier sections of this plan, due to the highly complex nature of today's water supply issues this lay volunteer board is hard pressed to review and decide upon matters in a timely fashion. Nevertheless there is still a need to maintain the advisory nature of the council to aid the Department in policy determination and planning. Therefore the WP&SC will be replaced by a water supply advisory council, with membership including, among others, a representative of the water supply industry.

The transfer of allocation authority to the Department of Environmental Protection will provide a uniform water diversion permit system and fee schedule. The State is developing a system which provides for, and requires, a permit for all major diverters in the State. This system will enable the allocation or reallocation of any or all of the water of the State to ensure the health, safety, economic and general welfare of the people of the State.

This permit program will include all previously held diversion rights. The State will ensure that the diversions follow proper standards and procedures in order that:

- only the permitted quantity is diverted and only for the purposes as expressed by the user and approved by the State;
- the withdrawal and use of the water does not significantly alter its quality; and that
- the withdrawal will be metered and the quantity used will be reported to enable a more accurate determination of impacts of future allocation requests. (NOTE: Due to the extreme importance of the agricultural community and of the generally low profit margin and limited manpower, special procedure have been provided by the Legislature.)

Safeguards for all interests affected will be provided through a public hearing process when requested. Previous attempts to discuss changes in the allocation process requiring all diverters of water to apply for and receive a permit to do so from the Department of Environmental Protection, have met with strong opposition from some groups in New Jersey. Grandfather rights are fiercely protected and there exists an impression that any move on the part of the State to regulate these diversions is a move to prohibit these diversions.

The State acknowledges these attitudes. Nevertheless, the increasingly complex nature of water supply management and protection demand that decisions be made carefully in light of all available information relative to that decision. The State cannot be expected to make decisions that protect the fair and equitable right of use of the resource without understanding the existing use. Without a permit procedure which provides accurate withdrawal information compared to updated monitoring data, any allocation process would be inadequate at best and could be harmful to the economic health and/or resource management in New Jersey. A sound, technically supported permitting allocation system will constitute a protection for all legitimate uses of that resource. The State will set such a program as its priority in its water supply management program and will aggressively pursue such a program.

The State will also develop the inspection, monitoring and reporting and enforcement procedures necessary to make the permit process effective. In order for this allocation process to be effective in protecting the use of the resource, decisions should be based on the concept of comprehensive watershed protection and management, as discussed on pages 93-97. The Department of Environmental Protection will develop standards and procedures to define a water supply emergency and will determine appropriate responsibility and procedures to alleviate that emergency. Droughts are just one type of water emergency which could be experienced in New Jersey.

As pointed out earlier in this plan, there are times when orders issued by the Department of Environmental Protection essential to ensure the health and safety of the consumer are not carried out due to problems associated with the rate structure. In order to comply with terms and conditions of permits and orders issued by the DEP, the law now provides the Board of Public Utilities and the Department of Community Affairs with the authority to ensure that adequate funding is provided by the purveyors under their respective supervision.

Another aspect of protection in relation to potable water is the determination of the systems safe yield in comparison to the demand on that system. As stated earlier, we have, in New Jersey, many systems that routinely distribute more water than can be expected from that system during periods of average precipitation. It has been made all too clear what results from this practice when we actually experience substandard precipitation. The State will exercise authority to require a water purveyor to develop additional supplies to service its users when the Department has determined that existing supplies are inadequate. Consideration should also be given to require elimination of excessive system losses before any new allocation or expansion of service area is approved. The DEP will charge purveyors having deficits with a proportionate share of the costs of state projects to remedy the deficit (as explained in the section on "Repayment") and in this manner provide a major financial incentive for the elimination of excessive leaks.

In the course of the development of this water supply plan, few issues generated the degree of public interest as did the question of diversion fees. To make the State's position clear, the State agrees with the consultants' findings that a diversion fee applicable to all major diverters would be a fair and equitable way to manage the resource and assure the users of that resource that their rights to use would be protected from encroachments and contamination. A fee structure where the user of a resource pays for the protection of that resource is considered by the State as fair. Nevertheless, the State cannot and will not ignore the concerns expressed in opposition to this theory. The State will continue to depend for the most part on State and Federally appropriated funds to manage its water supply program while pursuing the collection of permit fees to cover only the administrative cost of executing an effective allocation program. This permit fee is not to be confused with the diversion fee as recommended by the consultants since the State's proposed permit fee is designed to simply cover the administrative costs of the allocation/ permit process. As the State moves to implement the activities addressed in this work plan, we will reexamine the diversion fee proposal and reintroduce discussion.

## SMALL WATER COMPANIES

In the subtask reports prepared by the consultants, it was made clear that major problems exist with mismanagement, or lack of management of many of our small water companies. (A small water company is any company, purveyor or entity, other than a governmental agency, that provides water for human consumption and which regularly serves less than 1,000 customers.) These small companies are often approved by local municipalities as part of a new housing development without sufficient consideration for future operation and management. If fallen into disrepair and ordered by the DEP to upgrade, the company often does not have the resources to perform the needed improvement.

The State will pursue an awareness program designed to inform local governments of the potential implication of their decisions related to small water company approvals. In addition, the State will pursue authority to require the governmental units responsible for approval of systems which have failed to provide a safe and adequate supply to assume responsibility for answering orders issued against the small water company. The State will also examine the possibility of requiring well run systems, within proximity, to take over the collection, treatment and distribution of the potable supply either through purchase or merger of the small system.

## STATE WATER SUPPLY FACILITIES

A major aspect of water supply planning, as described in this work plan is that the responsibility for development of water resources and operation of water supply systems should be commensurate with the lowest level of government capable of being financially responsible for the particular water supply project. Whenever possible, the State will work to assure this concept is carried out and will limit its activities to overall management and coordination.

Nevertheless, it is becoming increasingly more expensive, more politically sensitive and more technically complicated to secure new sources of water. As we expand our understanding of the total water resource picture, we realize that the impacts of major water supply efforts often spread outside a specific region. In efforts to assure appropriate drought insurance and source protection, responsibilities become clouded.

The State has already become involved in the water supply business through the Round Valley - Spruce Run Reservoir System and the Delaware and Raritan Canal. The consultants pointed out the problems associated with this type system wherein all monies collected by the State run utility are turned over to the General Fund. The Department of Environmental Protection's Water Facilities Operations must then compete with all other State programs for funding, and may therefore receive inadequate funding for continuation of service.

The State perceives that it may be necessary to expand its water supply utility involvement in the future. As purveyors find it more economically and politically difficult to develop new supplies adequate for drought situations, and therefore procrastinate in efforts to expand their water supply sources, the State is compelled to take a more active role.

In anticipation of more serious emergencies, the State should finance additional supplies for drought insurance. It is planned that the State will develop new State-owned supply facilities as necessary to supplement purveyor-owned supply systems in order that sufficient water be made available during even severe drought without curtailing environmental low flows.

In order to assure appropriate funding arrangements for these anticipated facilities, the legislature has authorized creation of the New Jersey Water Supply Authority, an entity with an independent financing structure with authority to sell specific water supply revenue bonds. In this manner, revenues generated through the sale of water would be returned to the entity responsible for design, construction, operation and management. Revenue bonds would be paid off through this generation of funds. This entity would be able to pursue the same goals that purveyors' systems must pursue regardless of whether it is a municipal system selling water to residents of the community, or a State run facility providing bulk water wholesale to a major purveyor system.

However, if the proposed bond issue is approved by referendum, there is no apparent need for the authority to issue bonds for capital funds in the near future. The functions of the authority will be the design, construction and operation of the State's water supply projects, based on the planning conducted by the Division of Water Resources. Such planning will include needs assessments, feasibility studies, environmental assessment and economic analyses.

## ACCOUNTABILITY OF ALL WATER SYSTEMS

As reported by the consultants, there is no consistency in the process of rate and service review of New Jersey's five hundred plus water purveyors. All investor-owned systems and any municipal system which sells water outside of its municipal service area is subject to rate review by the Board of Public Utilities. The BPU conducts an evaluation of the entire fiscal management of these systems as well as the quality of service provided, and makes a ruling on the appropriate rates.

Municipal systems which do not sell water outside of their municipal boundaries are not subject to a similar review. The Department of Community Affairs does collect financial information from all purveyors and does publish this information in an annual report but the DCA has no regulatory authority over these municipal systems to assure an appropriate rate structure or satisfactory performance.

It is critical that all water purveyors operate in a manner that assures deliverance of adequate quantity of quality potable water at a price commensurate with its costs. It is also important that a water utility have sufficient resources available to be able to respond to orders issued by the DEP when the adequacy or potability of the supply is below safe standards. The new water supply legislation provides this opportunity.

## PUBLIC INVOLVEMENT IN WATER SUPPLY PLANNING

Public participation was an important part of the process in developing the New Jersey Water Supply Plan. Each interim report prepared by the consultants was subject to a series of meetings before carefully selected committees whose members had a range of special interests. Members of these committees agreed to work closely with the State for the course of the program to evaluate and critique each portion of the plan. In addition, public hearings were held throughout the State on the Draft Plan. Due to this process, major changes took place in the plan prior to final printing. The resulting document and recommendations are undoubtedly better because of this review.

In order to continue this dialogue, and to encourage participation by other members of the public throughout the implementation of these and all other water resource programs, the Division of Water Resources is committed to the implementation of a Division-wide consolidated program of public involvement.

The Division is making changes in its structure to allow for this comprehensive program. It will attempt to incorporate positive features of each of the Division's previous public involvement programs while capitalizing on other regional, county, and local involvement efforts.

This program is being designed to be flexible and move with the Division as interests and priorities change. The Division is seeking a strong, informed citizenry to assure a proper check and balance in our decision making and regulatory process.

For the purpose of facilitating the involvement process, the Division will address the State in six regions. Regional lines are being designed to consolidate areas with similarity of concerns and issues. In each Region, the Division will work with existing groups and interested individuals to establish the appropriate dialogue and information transfer. Quarterly, the Division will hold open public meetings to meet personally with members of the public and address and discuss issues of Statewide and regional concerns. Status of regional activities will be provided and detailed attention to major issues, as identified by the people of the region, will be given. Division management staff will participate in these meetings and appropriate follow-up action will be taken. Certain activities may result in a more detailed and structured process such as specific project selections but every effort will be made to coordinate these involvement efforts with the comprehensive program.

The Department will be examining the feasibility of expanding this Division program to allow for coordination with other Divisions and activities of the Department of Environmental Protection.

# APPENDICES

Appendix 1

## ECONOMIC COMPARISON OF MONKSVILLE PROJECT WITH THE RARITAN PASSAIC DIVERSION

At the request of certain interested parties, an analysis has been made of the respective costs of the two projects, per million gallons daily of additional safe yield provided, over an extended period of time. Different assumptions were made, alternately either 10% or 15% prevailing interest rate, and two alternative price assumptions namely, that all prices will increase uniformly, and that costs of electric energy will continue for 50 years to increase twice as fast as general prices. The results are expressed in each case in terms of present value in 1983 of the costs of providing 1 mgd of additional safe yield.

| CASE NO. | INT. RATE | RATE GENERAL PRICE INCREASE | RATE ELECTRICITY PRICE INCREASE | RARITAN PASSAIC DIVERSION | MONKSVILLE PROJECT |
|---|---|---|---|---|---|
| I | 10% | 5% | 5% | $1.18 million | 1.352 |
| II | 10% | 5% | 10% | 1.387 | 1.352 |
| III | 15% | 5% | 5% | 1.234 | 1.444 |
| IV | 15% | 10% | 10% | 1.30 | 1.444 |
| | | | Mean | 1.275 | 1.396 |

These results show that only on the unlikely assumption that electricity rates will increase at twice the general price rise over a fifty year period would the Monksville have a slight cost advantage; but this advantage would be reversed in favor of the Raritan Passaic Diversion if the interest rate should be 15% rather than 10%. The mean of the four computations shows the Monksville project to be more expensive, in terms of the new investment and operations and maintenance costs required to obtain it.

P. L. 1981, CHAPTER 261, *approved August 13, 1981*

Senate Committee Substitute for
1980 Senate No. 1610

AN ACT authorizing the creation of a debt of the State of New Jersey by the issuance of bonds of the State in the aggregate principal amount of $350,000,000.00 for the purposes of State or local projects to rehabilitate, repair or consolidate antiquated, damaged or inadequately operating water supply facilities; and to plan, design, acquire and construct various State water supply facilities, all as recommended by the New Jersey Statewide Water Supply Plan; providing the ways and means to pay the interest of such debt and also to pay and discharge the principal thereof; and providing for the submission of this act to the people at a general election; and providing an appropriation therefor.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

1. This act shall be known and may be cited as the "Water Supply Bond Act of 1981."

2. The Legislature finds and determines that:

a. The health, safety, welfare, commerce and prosperity of the people of the State depend on the availability of a safe, adequate and reliable supply of water.

b. Pursuant to the New Jersey Statewide Water Supply Plan, specific projects will be recommended to provide additional supplies of water, new transmission and distribution capabilities for existing supplies, increased reserve and emergency response capabilities, and increased water quality benefits which may reduce or eliminate the need for advanced wastewater treatment levels in certain areas.

c. This plan will further recommend specific projects to provide for the consolidation of deficiently operating facilities, in order to insure adequate services in the quantity and quality of water delivered, and to provide for the rehabilitation and repair of antiquated or damaged water supply facilities, thereby helping to conserve our vital water resources through leakage reduction and lending increased support to New Jersey's revitalization and economic development.

d. The sum of $350,000,000.00 is needed at this time to adequately implement the recommendations of this plan.

3. As used in this act:

a. "Bonds" means the bonds authorized to be issued, or issued under this act;

b. "Commission" means the New Jersey Commission on Capital Budgeting and Planning;

c. "Commissioner" means the Commissioner of Environmental Protection;

d. "Construct" and "construction" mean, in addition to the usual meaning thereof, acts of construction, reconstruction, replacement, extension, improvement and betterment;

e. "Cost" means the cost of acquisition or construction of all or any part of a project and of all or any real or personal property, agreements and franchises deemed by the department to be necessary or useful and covenient therefor or in connection therewith, including interest or discount on bonds, costs of issuance of bonds, cost of geological and hydrological services, administrative cost, interconnection testing, engineering and inspection costs and legal expenses, costs of financial, professional and other estimates and advice, organization, operating and other expenses prior to and during such acquisition or construction, and all such other expenses as may be necessary or incident to the financing, acquisition, construction and completion of such project or part thereof and the placing of the same in operation, and also such provisions for a reserve fund, or reserves for working capital, operating, maintenance or replacement expenses and for payment or security or principal of or interest on bonds during or after such acquisition or construction as the State Comptroller may determine;

f. "Department" means the Department of Environmental Protection;

g. "Project" means any work relating to water supply facilities;

h. "Real property" means lands, within or without the State, and improvements thereof or thereon, any and all rights-of-way, water, riparian and other rights, and any and all easements, and privileges in real property, and any right or interest of any kind or description in, relating to or connected with real property;

i. "Water supply facilities" means and refers to the real property and the plants, structures, interconnections between existing water supply facilities, machinery and equipment and other property, real, personal and mixed, acquired, constructed or operated, or to be acquired, constructed or operated, in whole or in part by or on behalf of the State, or of a political subdivision of the State or any agency thereof, for the purpose of augmenting the natural water resources of the State and making available an increased supply of water for all uses, or of conserving existing water resources, and any and all appurtenances necessary, useful or convenient for the collecting, impounding, storing, improving, treating, filtering, conserving or transmitting of water, and for the preservation and protection of these resources and facilities and providing for the conservation and development of future water supply resources, and facilitating incidental recreational uses thereof.

4. Bonds of the State of New Jersey are authorized to be issued in the aggregate principal amount of $350,000.000.00 for the purposes of providing loans for State or local projects for the rehabilitation, repair or consolidation of antiquated, damaged or inadequately operating water supply facilities, and to plan, design, acquire and construct State water supply facilities, all as recommended by the New Jersey Statewide Water Supply Plan.

5. a. The commissioner shall adopt such rules and regulations as are necessary and appropriate to carry out the provisions of this act. The commissioner shall review and consider the findings and recommendations of the commission in the administration of the provisions of this act.

b. The department, or the New Jersey Water Supply Authority, as the case may be, shall, in coordination with the Board of Public Utilities, develop a program to charge any water supply user which benefits from any project funded pursuant to this act, to the maximum extent practicable and feasible, for the full cost of planning, designing, acquiring, constructing and operating that project.

6. The bonds shall be serial bonds and known as "Water Supply Bonds" and as to each series, the last annual installment thereof (subject to redemption prior to maturity) shall mature and be paid not later than 35 years from the date of its issuance but may be issued in whole or in part for a shorter term. Said bonds shall be issued from time to time as the issuing officials herein named shall determine.

7. The Governor, State Treasurer and Comptroller of the Treasury or any two of such officials (hereinafter referred to as "the issuing officials") are hereby authorized to carry out the provisions of this act relating to the issuance of said bonds, and shall determine all matters in connection therewith subject to provisions hereof. In case any of said officials shall be absent from the State or incapable of acting for any reason, his powers and duties shall be exercised and performed by such person as shall be authorized by law to act in his place as a State official.

8. Bonds issued in accordance with the provisions of this act shall be a direct obligation of the State of New Jersey and the faith and credit of the State are pledged for the payment of the interest thereon as same shall become due and the payment of the principal at maturity. The principal and interest of such bonds shall be exempt from taxation by the State or by any county, municipality or other taxing district of the State.

9. The bonds shall be signed in the name of the State by the Governor or by his facsimile signature, under the Great Seal of the State, and attested by the Secretary of State, or an assistant Secretary of State, and shall be countersigned by the facsimile signature of the Comptroller of the Treasury. Interest coupons attached to said bonds shall be signed by the facsimile signature of the Comptroller of the Treasury. Such bonds may be issued notwithstanding that any of the officials signing them or whose facsimile signature appear on the bonds or coupons shall cease to hold office at the time of such issue or at the time of the delivery of such bonds to the purchaser.

10. a. The bonds shall recite that they are issued for the purposes set forth in section 4 of this act and that they are issued in pursuance of this act and that this act was submitted to the people of the State at the general election held in the month of November, 1981, and that it received the approval of the majority of votes cast for and against it at such election. Such recital in said bonds shall be conclusive evidence of the authority of the State to issue said bonds and of their validity. Any bonds containing such recital shall in any suit, action or proceeding involving their validity be conclusively deemed to be fully authorized by this act and to have been issued, sold, executed and delivered in conformity therewith and with all other provisions of statutes applicable thereto, and shall be incontestable for any cause.

b. Such bonds shall be issued in such denominations and in such form or forms, whether coupon or registered as to both principal and interest, and with or without such provisions for interchangeability thereof, as may be determined by the issuing officials.

11. When the bonds are issued from time to time the bonds of each issue shall constitute a separate series to be designated by the issuing officials. Each series of bonds shall bear such rate or rates of interest as may be determined by the issuing officials, which interest shall be payable semiannually; provided that the first and last periods may be longer or shorter, in order that intervening semiannual payments may be at convenient dates.

12. The bonds shall be issued and sold at such price not less than the par value thereof and accrued interest thereon, and under such terms, conditions and regulations as the issuing officials may prescribe, after notice of said sale, published at least once in at least three newspapers published in the State of New Jersey, and at least once in a publication carrying municipal bond notices and devoted primarily to financial news, published in New Jersey or the city of New York, the first notice to be at least 5 days prior to the day of bidding. The said notice of sale may contain a provision to the effect that any or all bids in pursuance thereof may be rejected. In the event of such rejection or of failure to receive any acceptable bid, the issuing officials, at any time within 60 days from the date of such advertised sale, may sell such bonds at private sale at such price not less than the par value thereof and accrued interest thereon and under such terms and conditions as the issuing officials may prescribe. The issuing officials may sell all or part of the bonds of any series as issued to any State fund or to the Federal Government or any agency thereof, at private sale, without advertisement.

13. Until permanent bonds can be prepared, the issuing officials may, in their discretion, issue in lieu of the permanent bonds temporary bonds in such form and with such privileges as to registration and exchange for permanent bonds as may be determined by the issuing officials.

14. The proceeds from the sale of the bonds shall be paid to the State Treasurer and be held by him in a separate fund, and be deposited in such depositories as may be selected by him to the credit of the fund, which fund shall be known as the "Water Supply Fund".

15. a. The moneys in said "Water Supply Fund" are hereby specifically dedicated and shall be applied to the cost of the purposes set forth in section 4 of this act, and all such moneys are hereby appropriated for such purposes, and no such moneys shall be expended for such purposes (except as otherwise hereinbelow authorized) without the specific appropriation thereof by the Legislature, but bonds may be issued as herein provided notwithstanding that the Legislature shall not have then adopted an act making specific appropriation of any said moneys. Any act appropriating moneys from the "Water Supply Fund" shall identify the particular project or projects to be funded by such moneys.

b. At any time prior to the issuance and sale of bonds under this act, the State Treasurer is hereby authorized to transfer from any available money in the Treasury of the State to the credit of the "Water Supply Fund" such sum as he may deem necessary. Said sum so transferred shall be returned to the treasury of this State by the treasurer thereof from the proceeds of the sale of the first issue of bonds.

c. Pending their application to the purpose provided in this act, moneys in the "Water Supply Fund" may be invested and reinvested as other trust funds in the custody of the State Treasurer in the manner provided by law. Net earnings received from the investment or deposit of such fund shall be paid into the General State Fund.

16. In case any coupon bonds or coupons thereunto appertaining or any registered bond shall become lost, mutilated or destroyed, a new bond shall be executed and delivered of like tenor, in substitution for the lost, mutilated or destroyed bonds or coupons, upon the owner furnishing to the issuing officials evidence satisfactory to them of such loss, mutilation or destruction, proof of ownership and such security and indemnity and reimbursement for expenses as the issuing officials may require.

17. Accrued interest received upon the sale of said bonds shall be applied to the discharge of a like amount of interest upon said bonds when due. Any expense incurred by the issuing officials for advertising, engraving, printing, clerical, legal or other services necessary to carry out the duties imposed upon them by the provisions of this act shall be paid from the proceeds of the sale of said bonds, by the State Treasurer upon warrant of the Comptroller of the Treasury, in the same manner as other obligations of the State are paid.

18. Bonds of each series issued hereunder shall mature in annual installments commencing not later than the tenth year and ending not later than the thirty-fifth year from the date of issue of such series, and in such amounts as shall be determined by the issuing officials, and the issuing officials may reserve to the State by appropriate provision in the bonds of any series the power to redeem all or any of such bonds prior to maturity at such price or prices and upon such terms and conditions as may be provided in such bonds.

19. The issuing officials may at any time and from time to time issue refunding bonds for the purpose of refunding in whole or in part an equal principal amount of the bonds of any series issued and outstanding hereunder, which by their terms are subject to redemption prior to maturity, provided such refunding bonds shall mature at any time or times not later than the latest maturity date of such series, and the aggregate amount of interest to be paid on the refunding bonds, plus the premium, if any, to be paid on the

bonds refunded, shall not exceed the aggregate amount of interest which would be paid on the bonds refunded if such bonds were not so refunded. Refunding bonds shall constitute direct obligations of the State of New Jersey, and the faith and credit of the State are pledged for the payment of the principal thereof and the interest thereon. The proceeds received from the sale of refunding bonds shall be held in trust and applied to the payment of the bonds refunded thereby. Refunding bonds shall be entitled to all the benefits of this act and subject to all its limitations except as to the maturities thereof and to the extent herein otherwise expressly provided.

20. To provide funds to meet the interest and principal payment requirements for the bonds issued under this act and outstanding, there is hereby appropriated in the order following:

a. Revenue derived from the collection of taxes as provided by the "Sales and Use Tax Act," P. L. 1966, c. 30 (C. 54:32B-1 et seq.) as amended and supplemented, or so much thereof as may be required; and

b. If in any year or at any time funds, as hereinabove appropriated, necessary to meet interest and principal payments upon outstanding bonds issued under this act, be insufficient or not available then and in that case there shall be assessed, levied and collected annually in each of the municipalities of the counties of this State a tax on real and personal property upon which municipal taxes are or shall be assessed, levied and collected, sufficient to meet the interest on all outstanding bonds issued hereunder and on such bonds as it is proposed to issue under this act in the calendar year in which such tax is to be raised and for the payment of bonds falling due in the year following the year for which the tax is levied. The tax thus imposed shall be assessed, levied and collected in the same manner and at the same time as other taxes upon real and personal property are assessed, levied and collected. The governing body of each municipality shall cause to be paid to the county treasurer of the county in which such municipality is located, on or before December 15 in each year, the amount of tax herein directed to be assessed and levied, and the county treasurer shall pay the amount of said tax to the State Treasurer on or before December 20 in each year.

If on or before December 31 in any year the issuing officials shall determine that there are moneys in the General State Fund beyond the needs of the State, sufficient to meet the principal of bonds falling due and all interest payable in the ensuing calendar year, then and in the event such issuing officials shall by resolution so find and shall file the same in the office of the State Treasurer, whereupon the State Treasurer shall transfer such moneys to a separate fund to be designated by him, and shall pay the principal and interest out of said fund as the same shall become due and payable, and the other sources of payment of said principal and interest provided for in this section shall not then be available, and the receipts for said year from the tax specified in subsection a. of this section shall thereon be considered and treated as part of the General State Fund, available for general purposes.

21. Should the State Treasurer, by December 31 of any year, deem it necessary, because of insufficiency of funds to be collected from the sources of revenues as hereinabove provided, to meet the interest and principal payments for the year after the ensuing year, then the treasurer shall certify to the Comptroller of the Treasury the amount necessary to be raised by taxation for such purposes, the same to be assessed, levied and collected for and in the ensuing calendar year. In such case the Comptroller of the Treasury shall, on or before March 1 following, calculate the amount in dollars to be assessed, levied and collected as herein set forth in each county. Such calculation shall be based upon the corrected assessed valuation of such county for the year preceding the year in which such tax is to be assessed, but such tax shall be assessed, levied and collected upon the assesed valuation of the year in which the tax is assessed and levied. The Comptroller of the Treasury shall certify said amount to the county board of taxation and the county treasurer of each county. The said county board of taxation shall include the proper amount in the current tax levy of the several taxing districts of the county in proportion to the ratables as ascertained for the current year.

22. For the purpose of complying with the provisions of the State Constitution this act shall, at the general election to be held in the month of November, 1981, be submitted to the people. In order to inform the people of the contents of this act, it shall be the duty of the Secretary of State, after this section shall take effect, and at least 15 days prior to the said election, to cause this act to be published in at least 10 newspapers published in the State and to notify the clerk of each county of this State of the passage of this act, and the said clerks respectively, in accordance with the instructions of the Secretary of State, shall cause to be printed on each of the said ballots, the following:

If you approve the act entitled below, make a cross (×), plus (+), or check (√) mark in the square opposite the word "Yes." If you disapprove the act entitled below, make a cross (×), plus (+), or check (√) mark in the square opposite the word "No."

If voting machines are used, a vote of "Yes" or "No" shall be equivalent to such markings respectively.

| | | |
|---|---|---|
| | Yes. | WATER SUPPLY BOND ISSUE<br>Should the "Water Supply Bond Act of 1981," which authorizes the State to issue bonds in the amount of $350,000,000.00 for the purposes of rehabilitating, repairing or consolidating antiquated, damaged or inadequately operating water supply facilities, and for the planning, design, acquisition and construction of water supply facilities, all as recommended by the New Jersey Statewide Water Supply Plan, and providing the ways and means to pay and discharge the principal thereof, be approved? |
| | No. | INTERPRETIVE STATEMENT<br>Approval of this act would authorize the sale of $350,000,000.00 in bonds to be used for the rehabilitation, repair or consolidation of existing water supply facilities and for the planning, design, acquisition and construction of water supply facilities, all as recommended by the New Jersey Statewide Water Supply Plan, to solve water supply problems in different areas of New Jersey and to assure the availability of safe, adequate and reliable water supplies to the people of the State. |

The fact and date of the approval or passage of this act, as the case may be, may be inserted in the appropriate place after the title in said ballot. No other requirements of law of any kind or character as to notice or procedure except as herein provided need be adhered to.

The said votes so cast for and against the approval of this act, by ballot or voting machine, shall be counted and the result thereof returned by the election officer, and a canvass of such election had in the same manner as is provided for by law in the case of the election of a Governor, and the approval or disapproval of this act so determined shall be declared in the same manner as the result of an election for a Governor, and if there shall be a majority of all the votes cast for and against it at such election in favor of the approval of this act, then all the provisions of this act not made effective theretofore shall take effect forthwith.

23. There is appropriated the sum of $5,000.00 to the Department of State for expenses in connection with the publication of notice pursuant to section 22.

24. The commissioner shall submit to the State Treasurer and the commission with the department's annual budget request a plan for the expenditure of funds from the "Water Supply Fund" for the upcoming fiscal year. This plan shall include the following information: a performance evaluation of the expenditures made from the fund to date; a description of programs planned during the upcoming fiscal year; a copy of the regulations in force governing the operation of programs that are financed, in part or whole, by funds from the "Water Supply Fund"; and an estimate of expenditures for the upcoming fiscal year.

25. Immediately following the submission to the Legislature of the Governor's Annual Budget Message the commissioner shall submit to the relevant standing committees of the Legislature, as designated by the President of the Senate and the Speaker of the General Assembly, and to the special joint legislative committee created pursuant to Assembly Concurrent Resolution No. 66 of the 1968 Legislature, as reconstituted and continued by the Legislature from time to time, a copy of the plan called for under section 24 of this act, together with such changes therein as may have been required by the Governor's budget message.

26. Not less than 30 days prior to the commissioner entering into any contract, lease, obligation, or agreement to effectuate the purposes of this act, the commissioner shall report to and consult with the special joint legislative committee created pursuant to Assembly Concurrent Resolution No. 66 of the 1968 Legislature as reconstituted and continued from time to time by the Legislature.

27. This section and sections 22 and 23 shall take effect immediately and the remainder of the act shall take effect as and when provided in section 22.

P. L. 1981, CHAPTER 262, *approved August 13, 1981*

Senate Committee Substitute for
1980 Senate Nos. 1611 and 1613

An Act concerning the management of water and the diversion of any surface or ground water anywhere in the State, and revising and repealing parts of the statutory law relating thereto.

Be it enacted *by the Senate and General Assembly of the State of New Jersey.*

1. This act shall be known and may be cited as the "Water Supply Management Act."

2. The Legislature finds and declares that the water resources of the State are public assets of the State held in trust for its citizens and are essential to the health, safety, economic welfare, recreational and aesthetic enjoyment, and general welfare, of the people of New Jersey; that ownership of these assets is in the State as trustee of the people; that because some areas within the State do not have enough water to meet their current needs and provide an adequate margin of safety, the water resources of the State and any water brought into the State must be planned for and managed as a common resource from which the requirements of the several regions and localities in the State shall be met; that the present regulatory system for these water resources is ineffective and counter-productive; that it is necessary to insure that within each basin there exists adequate water supplies to accommodate present and future needs; that to ensure an adequate supply and quality of water for citizens of the State, both present and future, and to protect the natural environment of the waterways of the State, it is necessary that the State, through its Department of Environmental Protection, have the power to manage the water supply by adopting a uniform water diversion permit system and fee schedule, a monitoring, inspection and enforcement program, a program to study and manage the State's water resources and plan for emergencies and future water needs, and regulations to manage the waters of the State during water supply and water quality emergencies.

**Explanation—Matter enclosed in bold-faced brackets [thus] in the above bill is not enacted and is intended to be omitted in the law.**

3. As used in this act:

a. "Commissioner" means the Commissioner of the Department of Environmental Protection or his designated representative;

b. "Consumptive use" means any use of water diverted from surface or ground waters other than a nonconsumptive use as defined in this act;

c. "Department" means the Department of Environmental Protection;

d. "Diversion" means the taking or impoundment of water from a river, stream, lake, pond, aquifer, well, other underground source, or other waterbody, whether or not the water is returned thereto, consumed, made to flow into another stream or basin, or discharged elsewhere;

e. "Nonconsumptive use" means the use of water diverted from surface or ground waters in such a manner that it is returned to the surface or ground water at or near the point from which it was taken without substantial diminution in quantity or substantial impairment of quality;

f. "Person" means any individual, corporation, company, partnership, firm, association, owner or operator of a water supply facility, political subdivision of the State and any state, or interstate agency or Federal agency;

g. "Waters" or "waters of the State" means all surface waters and ground waters in the State.

4. a. Upon a finding by the commissioner that there exists or impends a water supply shortage of a dimension which endangers the public health, safety, or welfare in all or any part of the State, the Governor is authorized to proclaim by executive order a state of water emergency. The Governor may limit the applicability of any state of emergency to specific categories of water supplies or to specific areas of the State in which a shortage exists or impends.

b. The department shall, within 180 days of the effective date of this act, adopt an Emergency Water Supply Allocation Plan as a rule and regulation. This plan shall be utilized as the basis for imposing water usage restrictions during a declared state of water emergency and shall include a priority system for the order in which restrictions would be imposed upon the various categories of water usage.

c. During the duration of a state of water emergency the commissioner, to the extent not in conflict with applicable Federal law or regulation but notwithstanding any State or local law or contractual agreement, shall be empowered to:

(1) Order any person to reduce by a specified amount the use of any water supply; to make use of an alternate water supply where possible; to make emergency interconnections between systems; to transfer water from any public or private system; or to cease the use of any water supply;

(2) Order any person engaged in the distribution of any water supply to reduct or increase by a specified amount or to cease the distribution of that water supply; to distribute a specified amount of water to certain users as specified by the commissioner; or to share any water supply with other distributors thereof;

(3) Establish priorities for the distribution of any water supply;

(4) Adopt rules and regulations as are necessary and proper to carry out the purposes of this section; and

(5) Direct any person engaged in the retail distribution of water to impose and collect a surcharge on the cost of that water as a penalty for the violation of any order to reduce water usage issued pursuant to this subsection. The disposition of all sums collected pursuant to this subsection shall be as provided by law; and

(6) Otherwise implement the Emergency Water Supply Allocation Plan adopted pursuant to subsection b. of this section.

Any order issued by the commissioner pursuant to this subsection shall be based upon fair compensation, reasonable rate relief and just and equitable terms, to be determined after notice and hearing which may occur subsequent to the order and compliance therewith.

d. During the existence of a state of water emergency, the Governor may order the suspension of any laws, rules, regulations, or orders of any department or agency in State Government or within any political subdivision which deal with or affect water and which impede his ability to alleviate or terminate a state of water emergency.

e. Any aggrieved person, upon application to the commissioner, shall be granted a review of whether the continuance of any order issued by the commissioner pursuant to this section is unreasonable in light of then prevailing conditions of emergency.

f. During a state of water emergency the commissioner may require any other department or other agency within State Government to provide information, assistance, resources, and personnel as shall be necessary to discharge his functions and responsibilities under this act, rules and regulations adopted hereunder, or applicable Federal law and regulations.

g. The powers granted to the Governor and the commissioner under this section shall be in addition to and not in limitation of any emergency powers now or hereafter vested in the Governor, the commissioner, or any other State department or agency pursuant to any other laws; except that, upon declaring a state of energy emergency, the Governor may supersede any other emergency powers.

h. The state of water emergency declared by the Governor pursuant to this section shall remain in effect until the Governor declares by a subsequent executive order that the state of water emergency has terminated.

5. The commissioner shall have the power to adopt, enforce, amend or repeal, pursuant to the "Administrative Procedure Act," P. L. 1968, c. 410 (C:52:14B-1 et seq.) rules and regulations to control, conserve, and manage the water supply of the State and the diversions of that water supply to assure the citizens of the State an adequate supply of water under a variety of conditions and to carry out the intent of this act. These rules and regulations may apply throughout the State or in any region thereof and shall provide for the allocation or the reallocation of the waters of the State in such a manner as to provide an adequate quantity and quality of water for the needs of the citizens of the State in the present and in the future and may include, but shall not be limited to:

a. A permit system to allocate or reallocate any or all of the waters of the State, which system shall provide for the issuance of permits to diverters of more than 100,000 gallons per day of the waters of the State, containing at a minimum the conditions required by this act;

b. Standards and procedures to be followed by diverters to ensure that:

(1) Proper methods are used to divert water;

(2) Only the permitted quantity of water is diverted and that the water is only used for its permitted purpose;

(3) The water quality of the water source is maintained and the water standards for the use of the water are met;

(4) The department is provided with adequate and accurate reports regarding the diversion and use of water;

c. Inspection, monitoring, reporting and enforcement procedures necessary to implement and enforce the provisions of this act;.

d. Standards and procedures to be followed to determine the location, extent and quality of the water resources of the State and plan for their future use to meet the needs of the citizens of the State;

e. Standards and procedures to be followed to maintain the minimum water levels and flow necessary to provide adequate water quantity and quality;

f. Standards and procedures governing the maintenance of adequate capacity by, and withdrawal limits for, water purveyors.

6. a. The department in developing the permit system established by this act shall:

(1) Permit privileges previously allowed pursuant to lawful legislative or administrative action, except that the department may, after notice and hearing, limit the exercise of these privileges to the extent currently exercised, subject to contract, or reasonably required for a demonstrated future need. All diversion permits issue by the Water Policy and Supply Council prior to the effective date of this act shall remain in effect until modified by the department pursuant to this act. Persons having or claiming a right to divert more than 100,000 gallons of water per day pursuant to prior legislative or administrative action, including persons previously exempted from the requirement to obtain a permit, shall renew that right by applying for a permit, or water usage certification, as the case may be, within 180 days of the effective date of this act. Thereafter, the conditions of the new permit or certification shall be conclusive evidence of such previously allowed privileges.

(2) Require any person diverting 100,000 or more gallons of water per day for agricultural or horticultural purposes to obtain departmental approval, in consultation with the appropriate county agricultural agent, of a 5 year water usage certification program. This program shall include the right to construct, repair or reconstruct dams or other structures, the right to divert water for irrigation, frost protection, harvesting and other agriculturally-related purposes, and the right to measure the amount of water diverted by means of a log or other appropriate record, and shall be obtained in lieu of any permit which would otherwise be required by this act.

b. Nothing in this act shall prevent the department form including, or require the department to include, the presently non-utilized existing privileges in the new or any future diversion permits issued to the present possessors of these privileges, except as otherwise expressly provided in subsection a. of this section.

7. a. Except as provided by section 6 of this act, no person may divert more than 100,000 gallons per day of any waters of the State or construct any building or structure which may require a diversion

of water unless he obtains a diversion permit. Prior to issuing these permits, the department shall afford the general public with reasonable notice of permit applications, and with the opportunity to be heard thereon at a public hearing held by the department.

b. Every permit issued pursuant to this section and every water usage certification approved pursuant to section 6 of this act shall be renewed by the department upon the expiration thereof, with any conditions deemed appropriate by the department, for the same quantity of water, except that the department may, after notice and hearing, limit that quantity to the amount currently diverted, subject to contract, or reasonably required for a demonstrated future need.

8. Every permit issued pursuant to this act shall include provisions:

a. Fixing the term of the permit;

b. Fixing the maximum allowable diversion, expressed in terms of a daily or monthly diversion;

c. Identifying and limiting the use or uses to which the water may be put;

d. Requiring the diverter to meter the water being diverted and report the amount and quality of the water being diverted;

e. Allowing the department to enter the diverter's facilities or property to inspect and monitor the diversion;

f. Requiring that all water diverted for a nonconsumptive use be returned to a reasonably proximate body of water designated by the department;

g. Allowing the transfer of a permit with the consent of the department, but only for the identical use of the waters by the transferee;

h. Governing the operations and maintenance of the specific facilities, equipment or premises not otherwise established in regulations because of the unique nature of the facilities, equipment or premises;

i. Permitting the department to modify, suspend or terminate the permit, after notice and hearing, for violations of its conditions, this act, regulations adopted or orders issued by the department, and when deemed necessary for the public interest.

9. The Board of Public Utilities shall fix just and reasonable rates for any public water supply system subject to its jurisdiction, as may be necessary for that system to comply with an order issued by the department or the terms and conditions of a permit issued pursuant to this act.

10. Any expenditures necessary to comply with an order or permit issued by the department for construction, improvement, repair or rehabilitation of public water supply systems shall, for the purposes of P. L. 1976, c. 68 (C. 40A:4-45.1 et seq.), be considered as expenditures mandated by State law.

11. The department shall in accordance with a fee schedule adopted by rule and regulation, establish and charge reasonable administrative fees, which fees shall be based upon, and not exceed, the estimated cost of processing, monitoring, administering and enforcing the diversion permits. The department shall deposit the fees in the "Environmental Services Fund" created by P. L. 1975, c. 232 (C. 13:1D-30 et seq.). There shall be annually appropriated an amount equivalent to the amount anticipated to be collected as fees by the department for the administration of the water supply management program.

12. No person supplying or proposing to supply water to any other person shall have the power to condemn lands, water or water privileges for any new or additional source of ground or surface water until that person has first submitted to the department an application for approval to divert the source of the water and the department has approved the application subject to such conditions as it may determine to be necessary to protect the public health and welfare.

13. a. Within 180 days of the effective date of this act, the department shall prepare and adopt the New Jersey Statewide Water Supply Plan, which plan shall be revised and updated at least once every 5 years.

b. The plan shall include, but need not be limited to, the following:

(1) An identification of existing Statewide and regional ground and surface water supply sources, both interstate and intrastate, and the current usage thereof;

(2) Projections of Statewide and regional water supply demand for the duration of the plan;

(3) Recommendations for improvements to existing State water supply facilities, the construction of additional State water supply facilities, and for the interconnection or consolidation of existing water supply systems; and

(4) Recommendations for legislative and administrative actions to provide for the maintenance and protection of watershed areas.

c. Prior to adopting the plan, the department shall:

(1) Prepare and make available to all interested persons a proposed plan;

(2) Conduct public meetings in the several geographic areas of the State on the proposed plan; and

(3) Consider the comments made at these meetings, make any revisions to the proposed plan as it deems necessary, and adopt the plan.

14. a. When the department determines that the developed water supply available to a water purveyor is inadequate to service its users with an adequate supply of water under a variety of conditions, the department may order the water purveyor to develop or acquire, within a reasonable period of time, additional water supplies sufficient to provide that service.

b. The Division of Local Government Services in the Department of Community Affairs shall, when reviewing the annual budget of any municipality, county, or agency thereof which operates a public water supply system, certify that an amount sufficient to cover the cost of any order issued to the municipality, county or agency thereof pursuant to subsection a. of this section is included in that annual budget.

15. The department may:

a. Perform any and all acts and issue such orders as are necessary to carry out the purposes and requirements of this act;

b. Administer and enforce the provisions of this act and rules, regulations and orders promulgated, issued or effective hereunder;

c. Present proper identification and then enter upon any land or water for the purpose of making any investigation, examination or survey contemplated by this act;

d. Subpena and require the attendance of witnesses and the production by them of books and papers pertinent to the investigations and inquiries the department is authorized to make under this act, and examine them and such public records as shall be required in relation thereto;

e. Order the interconnection of public water supply systems, whether in public or private ownership, whenever the department determines that the public interest requires that this interconnection be made, and require the furnishing of water by means of that system to another system, but no order shall be issued before comments have been solicited at a public hearing, notice of which has been published at least 30 days before the hearing, in one newspaper circulating generally in the area served by each involved public water supply system, called for the purpose of soliciting comments on the proposed action;

f. Order any person diverting water to improve or repair its water supply facilities so that water loss is eliminated so far as practicable, safe yield is maintained and the drinking water quality standards adopted pursuant to the "Safe Drinking Water Act," P. L. 1977, c. 224 (C. 58:12A-1 et seq.) are met;

g. Enter into agreements, contracts, or cooperative arrangements under such terms and conditions as the department deems appropriate with other states, other State agencies, Federal agencies, municipalities, counties, educational institutions, investor owned water companies, municipal utilities authorities, or other organizations or persons;

h. Receive financial and technical assistance from the Federal Government and other public or private agencies;

i. Particpate in related programs of the Federal Government, other states, interstate agencies, or other public or private agencies or organizations;

j. Establish adequate fiscal controls and accounting procedures to assure proper disbursement of and accounting for funds appropriated or otherwise provided for the purpose of carrying out the provisions of this act;

k. Delegate those responsibilities and duties to personnel of the department as deemed appropriate for the purpose of administering the requirements of this act;

l. Combine permits issued pursuant to this act with permits issued pursuant to any other act whenever that action would improve the administration of both acts;

m. Evaluate and determine the adequacy of ground and surface water supplies and develop methods to protect aquifer recharge areas.

16. If any person violates any of the provisions of this act or any rule, regulation or order adopted or issued pursuant to the provisions of this act, the department may institute a civil action in a court of competent jurisdiction for injunctive relief to enforce said provisions and to prohibit and prevent that violation and the court may proceed in the action in a summary manner. Any person who violates the provisions of this act or any rule, regulation or order adopted or issued pursuant to this act shall be liable to a civil administrative penalty of not more than $5,000.00 for each offense to be imposed by the department pursuant to standards adopted in regulations; or a civil penalty of not more than $5,000.00 for each offense, to be collected in a civil action by a summary proceeding under "the penalty enforcement law" (N. J. S. 2A:58-1

et seq.) or in any case before a court of competent jurisdiction wherein injunctive relief has been requested. The Superior Court and county district court shall have jurisdiction to enforce the penalty enforcement law. If the violation is of a continuing nature, each day during which it continues shall constitute an additional, separate and distinct offense. The department is authorized to compromise and settle any claim for a penalty under this section in such amount in the discretion of the department as may appear appropriate and equitable under all of the circumstances.

17. All of the powers, duties and functions of the Water Policy and Supply Council are transferred to the Department of Environmental Protection. Whenever the term "Water Policy and Supply Council" occurs or any reference is made thereto in any law, contract or document, administrative or judicial determination, or otherwise, it shall be deemed to mean or refer to the Department of Environmental Protection.

18. a. There is established in the department a Water Supply Advisory Council which shall consist of seven members appointed by the Governor with the advice and consent of the Senate. Each of these members shall be appointed for a term of 3 years, provided that, of the members first appointed by the Governor, three shall serve for terms of 1 year, two shall serve for terms of 2 years, and two shall serve for terms of 3 years. Of these members, one shall be a representative of the agricultural community, one shall be a representative of industrial and commercial water users, one shall be a representative of residential water users, one shall be a representative of investor-owned water companies, one shall be a representative of municipal or county water companies, one shall be a representative of private watershed protection associations and one shall be a representative of the academic community.

b. A majority of the membership of the council shall constitute a quorum for the transaction of council business. Action may be taken and motions and resolutions adopted by the council at any meeting thereof by the affirmative vote of a majority of the full membership of the council.

c. The council shall meet regularly as it may determine, and shall also meet at the call of the commissioner.

d. The council shall appoint a chairman from among its members and such other officers as may be necessary. The council may, within the limits of any funds appropriated or otherwise made available to it for this purpose, appoint such staff or hire such experts as it may require.

e. Members of the council shall serve without compensation, but the council may, within the limits of funds appropriated or otherwise made available for such purposes, reimburse its members for necessary expenses incurred in the discharge of their official duties.

19. The council shall:

a. Advise the department concerning the preparation, adoption and revision of the New Jersey Statewide Water Supply Plan;

b. Advise the department concerning the implementation of the permit program required by this act;

c. Advise the New Jersey Water Supply Authority concerning the construction, maintenance and operation of State water supply facilities and projects; and

d. Advise the department concerning the preparation and implementation of the Emergency Water Supply Allocation Plan.

20. The council may:

a. Review any matter relating to water supply and to transmit such recommendations thereon to the department or to the New Jersey Water Supply Authority as it may deem appropriate;

b. Hold public meetings or hearings within this State on any matter related to water supply; and

c. Call to its assistance and avail itself of the services of such employees of any State, county or municipal department, board, commission or agency as may be required and made available for such purposes.

21. R. S. 58:2-2 is amended to read as follows:

58:2-2. Payment for water diverted as provided in [section] *R. S.* 58:2-1 [of this title] shall be deemed to be a license and its amount shall be fixed by the [State Water Policy Commission] *department* at a rate of not less than $1.00 nor more than $10.00 per million gallons. If at all times an amount equal to the average daily flow for the driest month, as shown by the existing records, or in lieu thereof 175,000 gallons daily for each square mile of unappropriated watershed above the point of diversion, shall be allowed to flow down the stream. The [commission] *department* shall fix the minimum rate and may increase the rate proprotionally as a less amount is allowed to flow down the stream below the point of diversion, due account being taken in fixing said increase both of the duration and amount of the deficiency. The aforesaid 125,000 gallons daily for each square mile of unappropriated watershed shall be additional to the dry-season flow or any part thereof which may be allowed to flow from any appropriated watershed or watersheds above the point of diversion.

Water diverted within the corporate limits of a municipality for manufacturing and fire purposes only and returned without pollution to the stream from which it was taken within said corporate limits shall not be reckoned in making up the aggregate amount diverted.

Any party aggrieved by the action of the [commission] *department* upon filing written complaint on or before March twentieth, shall be heard and permitted to give evidence of the facts, and the sum fixed may be changed, reduced, or cancelled, as the facts may warrant.

22. R. S. 58:2-3 is amended to read as follows:

58:2-3. The [State Water Policy Commission] *department* shall annually certify to the State Comptroller, as soon as practicable after January first, and not later than February fifteenth, the names of all municipalities, corporations or private persons owing money to the State for the diversion of water during the preceding year, with the amounts so due.

The State Comptroller shall promptly notify said municipalities, water companies or persons of their indebtedness to the State, and if said amounts are not paid to the State Treasurer on or before July first of the same year, the State Comptroller shall certify to the Attorney-General for collection the names of the delinquents and the amounts due from each, and the Attorney-General shall take immediate steps to collect the same in the name of the State.

All sums received as herein provided shall be [paid into the General State Fund and the expenses of the administration of this chapter shall be included in the annual appropriations bill] *deposited to the credit of the State and deemed as part of the Environmental Services Fund. The Legislature shall annually appropriate an amount equivalent to the amount anticipated to be collected as sums charged under this section in support of the water management programs.*

23. R. S. 58:2-4 is amended to read as follows:

58:2-4. In the case of the condemnation of subsurface, well or percolating water supplies, there shall be charged by the State a fee of $1.00 per million gallons from that portion of the supply for the acquisition of which the State's right of eminent domain is exercised for all water diverted, which charge shall be certified to the State Comptroller by the [State Water Policy Commission] *department* and its collection shall be enforced in the same manner as hereinbefore in this chapter provided in the case of excess diversion of surface water supplies.

24. R. S. 58:2-5 is amended to read as follows:

58:2-5. Nothing in this chapter shall be construed to confer upon any municipality, corporation or person, any franchise not already possessed by said municipality, corporation or person, but the approval of the [commission] *department* contained in its decision as provided in this chapter, shall constitute the assent of the State to the diversion of water as against the State in accordance with the terms of said decision.

25. Any rules and regulations promulgated pursuant to any statutes repealed by this act shall remain in effect until superseded by rules and regulations promulgated pursuant to this act. However, all such rules and regulations shall be reviewed and revised where necessary by the department within 2 years of the enactment of this act.

26. The following are repealed:
R. S. 58:1-2 through R. S. 58:1-25:
R. S. 58:1-28 through R. S. 57:1-34;
R. S. 58:3-1;
R. S. 58:6-1 through R. S. 58:6-5;
P. L. 1942, c. 24 (C. 58:1-25.1 through 58:1-25.25);
P. L. 1963, c. 181 § 1-14, 16, 17 (C. 58:1-35 through 58:1-50);
P. L. 1947, c. 375 (C. 58:4A-1 through 58:4A-4);
P. L. 1945, c. 22, § 9 (C. 13:1A-9);
P. L. 1948, c. 448, § 100, 101 (C. 13:1B-49 and 13:1B-50).

27. This act shall take effect immediately.

C. 58:1B-1 et seq.

## P. L. 1981, CHAPTER 293, *approved October 7, 1981*

Senate Committee Substitute for 1980 Senate No. 1612

An Act creating the New Jersey Water Supply Authority, empowering the authority to acquire, finance, construct and operate water systems under certain circumstances, authorizing the issuance of bonds of the authority, and providing for the terms and security thereof.

Be it enacted *by the Senate and General Assembly of the State of New Jersey:*

1. This act shall be known and may be cited as the "New Jersey Water Supply Authority Act."

2. The Legislature finds that a State authority should be established to acquire, finance, construct and operate water systems pursuant to the provisions of this act.

3. As used in this act:

a. "Authority" means the New Jersey Water Supply Authority created by this act;

b. "Bonds" means bonds, notes, or other obligations issued or authorized pursuant to this act;

c. "Compensating reservoir" means the structures, facilities and appurtenances for the impounding, transportation and release of water for the replenishment in periods of drought or at other necessary times of all or a part of waters in or bordering the State diverted into a project;

d. "Cost" as applied to a project means the cost of acquisition and construction thereof, the cost of acquisition of lands, rights-of-way, property rights, easements, and interests required by the authority for acquisition and construction, the cost of demolishing or removing any buildings or structures on land so acquired, including the cost of acquiring any lands to which buildings or structures may be moved, the cost of acquiring or constructing and equipping an office of the authority, the cost of machinery, furnishings, and equipment, financing expenses, reserves, interest prior to and during construction and for no more than 6 months after completion of construction, engineering, expenses of research and development with respect to any project, legal expenses, plans, specifications, surveys, estimates of cost and revenues, working capital, other expenses necessary or incident to determining the feasibility or practicability of acquiring or constructing a project, administrative expense, and such other expense as may be necessary or incident to the acquisition or construction of the project;

e. "Construct" and "construction" means and includes acts of construction, reconstruction, replacement, extension, improvement and betterment of a project;

f. "Department" means the Department of Environmental Protection;

g. "Governmental agency" means any municipality, county, or any agency thereof, the State Government and any instrumentality or subdivision thereof;

h. "Project" means a water system or any part thereof;

i. "Real property" means lands both within or without the State, and improvements thereof or thereon, or any rights or interests therein;

j. "Revenue" means all rents, fees and charges for water sold from, or for the use and services of any project of the authority and payments in respect of any loans or advances made to governmental agencies pursuant to this act;

k. "Service charges" means water service charges established or collected by the authority pursuant to this act;

l. "Water system" means the plants, structures and other real and personal property financed, acquired, constructed or operated or to be financed, acquired, constructed or operated by the authority under this act or additions and improvements thereto, including reservoirs, basins, dams, canals, aqueducts, standpipes, conduits, pipelines, mains, pumping stations, water transmission systems, compensating reservoirs, waterworks or sources of water supply, wells, purification or filtration plants or other plants, equipment and works, connections, rights of flowage or diversion, and other plants, structures, boats, conveyances, and other real and personal property and rights therein, and appurtenances necessary or useful and convenient for the accumulation, supply, treatment or transmission of water.

**4. a.** There is established in but not of the Department of Environmental Protection a public body corporate and politic, with corporate succession, to be known as the "New Jersey Water Supply Authority." The authority is hereby constituted as an instrumentality of the State exercising public and essential governmental functions.

b. The authority shall consist of the Commissioner of Environmental Protection, who shall be a member ex officio with full voting rights, and six public members appointed by the Governor with the advice and consent of the Senate for terms of 3 years; provided that of the members of the authority first appointed by the Governor, two shall serve for terms of 1 year, two shall serve for terms of 2 years, and two shall serve for terms of 3 years, of whom two shall be recognized experts in the fields of water resource management and distribution, and public finance, respectively. The remaining public members appointed by the Governor shall represent the following: the agricultural community, industrial water users, residential water users and private watershed associations. Each member shall hold office for the term of his appointment and until his successor shall have been appointed and qualified. A member shall be eligible for reappointment. Any vacancy in the membership occurring other than by expiration of term shall be filled in the same manner as the original appointment but for the unexpired term only.

c. Each appointed member may be removed from office by the Governor, for cause, after a public hearing, and may be suspended by the Governor pending the completion of the hearing. Each member before entering upon his duties shall take and subscribe an oath to perform the duties of his office faithfully, impartially and justly to the best of his ability. A record of these oaths shall be filed in the office of the Secretary of State.

d. The chairman, who shall be the chief executive officer of the authority, shall be the Commissioner of Environmental Protection, and the members of the authority shall elect one of their number as vice chairman thereof. The authority shall elect a secretary and a treasurer who need not be members, and the same person may be elected to serve both as secretary and treasurer. The powers of the authority shall be vested in the members thereof in office from time to time and four members of the authority shall constitute a quorum at any meeting thereof. Action may be taken and motions and resolutions adopted by the authority at any meeting thereof by the affirmative vote of at least four members of the authority. No vacancy in the membership of the authority shall impair the right of a quorum of the members to exercise all the powers and perform all the duties of the authority.

e. No resolution or other action of the authority providing for the issuance of bonds or the refunding of bonds shall be adopted or otherwise made effective by the authority without the prior approval, in writing, of the Governor and of the State Treasurer

7

or the Comptroller of the Treasury. A true copy of the minutes of every meeting of the authority shall be prepared and forthwith delivered to the Governor. No action taken at such meeting by the authority shall have effect until 10 days, exclusive of Saturdays, Sundays and public holidays, after the copy of the minutes has been so delivered. If, in this 10-day period, the Governor returns the copy of the minutes with a veto of any action taken by the authority at that meeting, the action shall be of no effect.

f. Each member and the treasurer of the authority shall execute a bond to be conditioned upon the faithful performance of the duties of the member or treasurer, as the case may be, in a form and amount as may be prescribed by the Comptroller of the Treasury. The bonds shall be filed in the office of the Secretary of State. At all times thereafter the members and treasurer of the authority shall maintain these bonds in full force. The costs of the bonds shall be borne by the authority.

g. The members of the authority shall serve without compensation, but the authority shall reimburse its members for actual expenses necessarily incurred in the discharge of their duties. No officer or employee of the State shall be deemed to have forfeited or shall forfeit his office or employment or any benefits or emoluments thereof by reason of his acceptance of the office of ex officio member of the authority.

h. The Commissioner of Environmental Protection may designate an officer or employee of the department to represent him at meetings of the authority, and the designee may lawfully vote and otherwise act on behalf of the commissioner. The designation shall be in writing delivered to the authority and shall continue in effect until revoked or amended by writing delivered to the authority.

i. The authority may be dissolved by act of the Legislature on condition that the authority has no debts or obligations outstanding or that provision has been made for the payment or retirement of debts or obligations. Upon a dissolution of the authority all property, funds and assets thereof shall be vested in the State.

5. a. All water supply facilities, owned or operated by the State, either now or hereafter, are transferred to the authority. The authority shall operate these facilities pursuant to the statutory authorizations enabling the State to operate and manage the facilities. The Delaware and Raritan Canal Transmission Complex, the Spruce Run-Round Valley Reservoir Complex and all other State-operated facilities now or hereafter authorized to be designed, constructed and operated pursuant to any past or future bond

issues, including the "Water Supply Bond Act of 1981," are specifically included as State water supply facilities.

b. The revenue from all State water supply facilities, the disposition of which is not otherwise expressly provided for by law, is pledged to the authority for the purposes provided herein.

6. a. The authority is hereby empowered to design, initiate, acquire, construct, maintain, repair and operate projects or cause the same to be operated pursuant to a lease, sublease, or agreement with any person or governmental agency, and to issue bonds of the authority to finance these projects, payable from the revenues and other funds of the authority. All projects undertaken by the authority shall conform to the recommendations of the New Jersey Statewide Water Supply Plan.

b. The authority shall be subject to compliance with all State health and environmental protection statutes and regulations and any other statutes and regulations not inconsistent herewith. The authority may, upon the request of a governmental agency, enter into a contract to provide services for any project.

c. The authority shall consult with the Water Supply Advisory Council from time to time prior to final action on any project or undertaking authorized pursuant to this section.

7. Except as otherwise limited by the act, authority shall have power:

a. To sue and be sued.

b. To have an official seal and alter the same at pleasure.

c. To make and alter bylaws for its organization and internal management and for the conduct of its affairs and business.

d. To maintain an office at such place or places within the State as it may determine.

e. To acquire, lease as lessee or lessor, rent, hold, use and dispose of real or personal property for its purposes.

f. To borrow money and to issue its negotiable bonds and to secure the same by a mortgage on its property or any part thereof and otherwise to provide for and secure the payment thereof and to provide for the rights of the holders thereof.

g. To fix and revise from time to time and charge and collect rents, fees and charges for any of the services rendered by the authority, which shall be equitably assessed.

h. To procure insurance against any losses in connection with its property, operations or assets in such amounts and from such insurers as it deems desirable.

i. Subject to any agreement with bondholders to invest moneys of the authority not required for immediate use, including proceeds from the sale of any bonds, in such obligations, securities and other investments as the authority shall deem prudent.

j. To appoint and employ an executive director and such additional officers who need not be members of the authority and accountants, financial advisors or experts and such other or different officers, agents and employees as it may require and determine their qualifications, terms of office, duties and compensation, all without regard to the provisions of Title 11, Civil Service, of the Revised Statutes, except with respect to those officers and employees of the Water Supply Facilities Element who are transferred to the authority pursuant to section 24 of this act, and these officers and employees shall remain subject to the provisions of that Title.

k. To contract for and to accept any gifts or grants or loans of funds or property or financial or other aid in any form from the United States of America or any agency or instrumentality thereof, or from the State or any agency, instrumentality or political subdivision thereof, or from any other source and to comply, subject to the provisions of this act, with the terms and conditions thereof.

l. To acquire, hold, rent, lease, use and dispose of real or personal property in the exercise of its powers and the performance of its duties under this act.

m. To acquire, subject to the provisions of any other statute, in the name of the authority by purchase or otherwise, on such terms and conditions and in such manner as it may deem proper, except with respect to property owned by the State, by the exercise of the power of eminent domain, any land and other property, which it may determine is reasonably necessary for any of its projects and any and all rights, title and interest in that land and other property, including, providing there is no prudent and feasible alternative, public lands, reservations, highways or parkways, owned by or in which the State or any county, municipality, public corporation, or other political subdivision of the State has any right, title or interest, or parts thereof or rights therein and any fee simple absolute or any lesser interest in private property, and any fee simple absolute in, easements upon or the benefit of restrictions upon, abutting property to preserve and protect the project.

n. To do and perform any acts and things authorized by the act under, through, or by means of its officers, agents or employees or by contracts with any person.

o. To establish and enforce rules and regulations for the use and operation of its projects and the conduct of its activities, and provide for the policing and the security of its projects.

p. To do any and all things necessary or convenient to carry out its purposes in accordance with the powers given and granted in the act.

8. a. Upon the exercise of the power of eminent domain, the compensation to be paid thereunder shall be ascertained and paid in the manner provided in P. L. 1971, c. 361 (C. 20:3-1 et seq.).

b. Whenever the authority shall determine that it is necessary that any public utility facilities such as tracks, pipes, mains, conduits, cables, wires, towers, poles and other equipment and appliances of any public utility, as defined in R. S. 48:2-13, which are now, or hereafter may be, located in, on, along, over or under any project, should be removed from such project, the public utility owning or operating such facilities shall relocate or remove the same in accordance with the order of the authority; provided however, that the cost and expenses of such relocation or removal, including the cost of installing such facilities in a new location or new locations, and the cost of any lands, or any rights or interests in lands, and any other rights acquired to accomplish such relocation or removal, less the cost of any lands or any rights of the public utility paid to the public utility in connection with the relocation or removal of such property, shall be ascertained and paid by the authority as a part of the cost of such project. In case of any such relocation or removal of facilities, as aforesaid, the public utility owning or operating the same, its successors or assigns, may maintain and operate such facilities, with the necessary appurtenances, in the new location, for as long a period, and upon the same terms and conditions, as it had the right to maintain and operate such facilities in their former location.

9. a. The authority is hereby empowered from time to time to issue its bonds in such principal amounts as in the opinion of the authority shall be necessary to provide sufficient funds for any of its corporate purposes, including the payment, funding or refunding of the principal of, or interest or redemption premiums on, any bonds issued by it whether the bonds or interest to be funded or refunded have or have not become due the establishment or increase of such reserves to secure or to pay such bonds or interest thereon and all other costs or expenses of the agency incident to and necessary to carry out its corporate purposes and powers.

b. Except as may be otherwise expressly provided in the act or by the authority, every issue of bonds shall be general obligations payable out of and secured by any revenues or funds of the authority, subject only to any agreements with holders of particular bonds pledging any particular revenues or funds. The authority may issue such types of bonds as it may determine, including, without limiting the generality of the foregoing bonds as to which the principal and interest are payable (1) exclusively from the revenues and funds derived from or relating to the project or part thereof financed with the proceeds of the bonds; (2) exclusively from the revenues and funds derived from or relating to certain designated projects or parts thereof, whether or not the same are financed in whole or in part from the proceeds of bonds; (3) exclusively from certain designated funds of the authority; or (4) from the revenues and funds of the authority generally. The bonds may be additionally secured by a pledge of any grant, subsidy or contribution from the United States of America or any agency or instrumentality thereof or the State of New Jersey or any agency, instrumentality or political subdivision thereof, or any person, or a pledge of any income or revenues, funds or moneys of the authority from any source whatsoever.

c. Whether or not the bonds are of such form and character as to be negotiable instruments under the terms of Title 12A, Commercial Transactions, New Jersey Statutes, the bonds are hereby made negotiable instruments within the meaning of and for all the purposes of said Title 12A, subject only to the provisions of the bonds for registration.

d. Bonds of the authority shall be authorized by a resolution or resolutions of the authority and may be issued in one or more series and shall bear such date, or dates, mature at such time or times, bear interest at such rate or rates of interest per annum, be in such denomination or denominations, be in such form, either coupon or registered, carry such conversion or registration privileges, have such rank or priority, be executed in such manner, be payable from such sources in such medium of payment at such place or places within or without the State, and be subject to such terms of redemption, with or without premium, as such resolution or resolutions may provide.

e. Bonds of the authority may be sold at public or private sale at such price or prices and in such manner as the authority shall determine. Every bond shall mature and be paid not later than 40 years from the date thereof.

f. Bonds may be issued under the provisions of the act without obtaining the consent of any department, division, commission, board, bureau or agency of the State, and without any other proceeding or the happening of any other conditions or other things than those proceedings, conditions or things which are specifically required by this act.

g. Bonds of the authority issued under the provisions of this act shall not be in any way a debt or liability of the State or of any political subdivision thereof other than the authority and shall not create or constitute any indebtedness, liability or obligation of the State or of the political subdivision or be or constitute a pledge of the faith and credit of the State or of the political subdivision but all such bonds, unless funded or refunded by bonds of the authority, shall be payable solely from revenues or funds pledged or available for their payment as authorized in the act. Each bond shall contain on its face a statement to the effect that the authority is obligated to pay the principal thereof or the interest thereon only from revenues or funds of the authority and that neither the State nor any political subdivision thereof is obligated to pay the principal or interest and that neither the faith and credit nor the taxing power of the State or any political subdivision thereof is pledged to the payment of the principal of or the interest on the bonds.

h. All expenses incurred in carrying out the provisions of the act shall be payable solely from revenues or funds provided or to be provided under the provisions of the act and nothing in this act shall be construed to authorize the authority to incur any indebtedness or liability on behalf of or payable by the State or any political subdivision thereof.

10. In any resolution of the authority empowering or relating to the issuance of any bonds the authority, in order to secure the payment of such bonds and in addition to its other powers, shall have power, by provisions therein which shall constitute covenants by the authority and contracts with the holders of the bonds:

a. To pledge all or any part of its rents, fees, tolls, revenues or receipts to which its right then exists or may thereafter come into existence, and the moneys derived therefrom, and the proceeds of any bonds.

b. To pledge any lease or other agreement or the rents or other revenues thereunder and the proceeds thereof.

c. To mortgage all or any part of its property, real or personal, then owned or thereafter to be acquired.

d. To covenant against pledging all or any part of its rents, fees, tolls, revenues or receipts or its leases or agreements or rents or other revenues thereunder or the proceeds thereof, or against mortgaging all or any part of its real or personal property then owned or thereafter acquired, or against permitting or suffering any lien on any of the foregoing.

e. To covenant with respect to limitations on any right to sell, lease or otherwise dispose of any project or any part thereof or any property of any kind.

f. To covenant as to any bonds to be issued and the limitations thereon and the terms and conditions thereof and as to the custody, application, investment, and disposition of the proceeds thereof.

g. To covenant as to the issuance of additional bonds or as to limitations on the issuance of additional bonds and on the incurring of other debts by it.

h. To covenant as to the payment of the principal of or interest on the bonds, or any other obligations, as to the sources and methods of payment, as to the rank on priority of the bonds with respect to any lien or security or as to the acceleration of the maturity of the bonds.

i. To provide for the replacement of lost, stolen, destroyed or mutilated bonds.

j. To covenant against extending the time for the payment of bonds or interest thereon.

k. To covenant as to the redemption of bonds and privileges of exchange thereof for other bonds of the authority.

l. To covenant as to the rates of toll and other charges to be established and charged, the amount to be raised each year or other period of time by tolls or other revenues and as to the use and disposition to be made thereof.

m. To covenant to create or authorize the creation of special funds or moneys to be held in pledge or otherwise for construction, operating expenses, payment or redemption of bonds, reserves or other purposes and as to the use, investment, and disposition of the moneys held in those funds.

n. To establish the procedure, if any, by which the terms of any contract or covenant with or for the benefit of the holders of bonds may be amended or abrogated, the amount of bonds the holders of which must consent thereto, and the manner in which the consent may be given.

o. To covenant as to the construction, improvement, or maintenance of its real and personal property, the replacement thereof, the insurance to be carried thereon, and the use and disposition of insurance moneys.

p. To provide for the release of property, leases or other agreements, or revenues and receipts from any pledge or mortgage and to reserve rights and powers in, or the right to dispose of, property which is subject to a pledge or mortgage.

q. To provide for the rights and liabilities, powers and duties arising upon the breach of any covenant, condition or obligation and to prescribe the events of default and the terms and conditions upon which any or all of the bonds of the authority shall become or may be declared due and payable before maturity and the terms and conditions upon which any such declaration and its consequences may be waived.

r. To vest in a trustee or trustees within or without the State such property, rights, powers and duties in trust as the authority may determine, including the right to foreclose any mortgage, and to limit the rights, duties and powers of the trustee.

s. To execute all mortgages, bills of sale, conveyances, deeds of trust and other instruments necessary or convenient in the exercise of its powers or in the performance of its covenants or duties.

t. To pay the costs or expenses incident to the enforcement of such bonds or of the provisions of the resolution or of any covenant or agreement of the authority with the holders of its bonds; and

u. To limit the rights of the holders of any bonds to enforce any pledge or covenant securing bonds.

11. Any pledge of revenues, moneys, funds or other property made by the authority shall be valid and binding from the time when the pledge is made. The revenues, moneys, funds or other property so pledged and thereafter received by the authority unless otherwise agreed, shall immediately be subject to the lien of the pledge without any physical delivery thereof or further act, and the lien of the pledge shall be valid and binding as against all parties having claims of any kind in tort, contract or otherwise against the authority, irrespective of whether the parties have notice thereof. Neither the resolution nor any other instrument by which a pledge of revenues, moneys or funds is created need be filed or recorded except in the records of the authority.

12. Neither the members of the authority nor any person executing bonds issued pursuant to this act shall be liable personally on the bonds by reason of the issuance thereof.

13. The authority may establish such reserves, funds or accounts as may be, in its discretion, necessary or desirable to further the accomplishment of the purposes of the authority or to comply with the provisions of any agreement made by or any resolution of the authority.

14. The State of New Jersey pledges to and covenants and agrees with the holders of any bonds issued pursuant to authority of the act that the State will not limit or alter the rights or powers vested in the authority to acquire, construct, maintain, improve, and repair

any project in any way that would jeopardize the interest of such holders, or to perform and fulfill the terms of any agreement made with the holders of the bonds, or to fix, establish, charge and collect such rents, fees, rates or other charges as may be convenient or necessary to produce sufficient revenues to meet all expenses of the authority and fulfill the terms of any agreement made with the holders of the bonds, together with interest thereon, with interest on any unpaid installments of interest, and all costs and expenses in connection with any action or proceedings by or on behalf of such holders, until the bonds, together with interest thereon, are fully met and discharged or provided for.

15. The State and all public officers, governmental units and agencies thereof, all banks, trust companies, savings banks and institutions, building and loan associations, savings and loan associations, investment companies, and other persons carrying on a banking business, all insurance companies, insurance associations and other persons carrying on an insurance business, and all executors, administrators, guardians, trustee and other fiduciaries, may legally invest any sinking funds, moneys or other funds belonging to them or within their control in any bonds issued pursuant to the act, and such bonds shall be authorized security for any and all public deposits.

16. Any governmental entity, notwithstanding any contrary provision of law, except any requiring notice or public hearing, is authorized to lease, lend, grant or convey to the authority at its request upon such terms and conditions as the governing body or other proper utility of such governmental entity may deem reasonable and fair and without the necessity for any advertisement, order of court or other action or formality, other than the ordinance, resolution or regular action thereof, any real property or interest therein which may be necessary or convenient to the effectuation of the purposes of the authority. No property of the State, other than meadowlands, riparian lands or lands underwater and similar lands or interests therein referred to and whose disposition is controlled by the provisions in Title 12, Commerce and Navigation, and Title 13, Conservation and Development, of the Revised Statutes, shall be so granted, leased or conveyed to the authority except upon the approval of the State House Commission and payment to the State of such price therefor as may be fixed by the State House Commission.

17. Every project, when constructed and placed in operation, shall be properly maintained and kept in good condition and repaired by the authority. Every project shall be operated by such

operating employees as the authority may in its discretion employ or pursuant to a contract or lease with a governmental agency or person.

18. Nothing in this act shall be construed to authorize or permit the authority to plan, initiate, acquire, construct, maintain, repair or operate any retail water system or project.

19. The authority may establish and alter rates and charges, and collect rents, fees and charges for water sold from, and for the use of services of any water system project and contract in the manner provided in this section with one or more persons, one or more governmental entities, or any combination thereof, receiving the use or services of any project, and fix the terms, conditions, rents, rates, fees and charges for such use or services.

The contract may provide for acquisition by such person or governmental agency of all or any part of the project for such consideration payable over the period of the contract or otherwise as the authority in its discretion determines to be appropriate, but subject to the provisions of any resolution of the authority authorizing the issuance of bonds or any trust agreement securing the same. Any water supply entity which has the power to construct, operate and maintain water management facilities may enter into a contract or lease with the authority whereby the use or services of any project of the authority will be made available to the entity and pay for the use or services such rents, rates, fees and charges as may be agreed to by the authority and the entity.

Any one or more public or private entity may cooperate with the authority in the acquisition or construction of a project and shall enter into such agreements with the authority as are necessary, with a view to effective cooperative action and safeguarding of the respective interests of the parties thereto, which agreements shall provide for such contributions by the parties thereto in such proportion as may be agreed upon and such other terms as may be mutually satisfactory to the parties including without limitation the authorization of the construction of the project by one of the parties acting as agent for all of the parties and the ownership and control of the project by the authority to the extent necessary or appropriate for purposes of the issuance of bonds by the authority. Any governmental agency may provide such contribution as is required under such agreements by the appropriation of money or, if otherwise authorized by law to issue bonds or levy taxes or assessments and issue bonds in anticipation of the collection thereof, by the issuance of bonds or by the levying of taxes or assessments and the issuance of bonds in anticipation of the collection thereof, and by the payment of such appropriated money or the proceeds of the bonds to the authority pursuant to such agreements.

20. On or before the last day of February in each year the authority shall make an annual report of its activities for the preceding calendar year to the Governor and to the Legislature. The report shall set forth a complete operating and financial statement covering its operations during the year. The authority shall cause an audit of its books and accounts to be made at least once in each year by certified public accountants and the cost thereof shall be considered an expense of the authority and a copy thereof shall be filed with the Comptroller of the Treasury.

21. All officers, departments, boards, agencies, divisions and commissions of the State are authorized to render such services to the authority as may be within the area of their respective governmental functions as fixed by law, and as may be requested by the authority. The cost and expense of the services shall be met and provided for by the authority. The Attorney General shall serve as counsel to the authority.

22. The authority is hereby authorized to make and enter into contracts and agreements necessary or incidental to the performance of its duties and the execution of its powers. No contract on behalf of the authority shall be entered into for the doing of any work, or for the hiring of equipment or vehicles, where the sum to be expended exceeds the sum of $2,500.00 unless the authority shall first publicly advertise for bids therefor, and shall award the contract to the lowest responsible bidder; but advertising shall not be required where the contract to be entered into is one for the furnishing or performing services of a professional nature or for the supplying of any product or the rendering of any service by a public utility subject to the jurisdiction of the Board of Public Utilities and tariffs and schedules of the charges, made, charged, or exacted by the public utility for any such products to be supplied or services to be rendered are filed with the board. This section shall not prevent the authority from having any work done by its own employees, nor shall it apply to repairs, or to the furnishing of materials, supplies or labor, or the hiring of equipment or vehicles, when the safety or protection of its or other public property or the public convenience require, or the exigency of the authority service will not admit of such advertisement. In such case the authority shall, by resolution, passed by the affirmative vote of a majority of its members, declare the exigency or emergency to exist, and set forth in the resolution the nature thereof and the approximate amount to be expended.

C 293-15

23. a. All projects and other property of the authority is declared to be public property devoted to an essential public and governmental function and purpose and shall be exempt from all taxes and special assessments of the State or any political subdivision thereof; provided, however, that when any part of the project site not occupied or to be occupied by facilities of the project is leased by the authority to another whose property is not exempt and the leasing of which does not make the real estate taxable, the estate created by the lease and the appurtenances thereto shall be listed as the property of the lessee thereof and be assessed and taxed as real estate. All bonds issued pursuant to this act are declared to be issued by a body corporate and public of the State and for an essential public and governmental purpose and these bonds, and the interest thereon and the income therefrom, and all funds, revenues, income and other moneys received or to be received by the authority and pledged or available to pay or secure the payment of the bonds, or interest thereon, shall be exempt from taxation except for transfer, inheritance and estate taxes.

b. Any project constructed, maintained or operated by the authority shall be exempt from compliance with local zoning regulations, but the authority shall wherever practicable adhere to the regulations.

24. The Water Supply Facilities Element in the Division of Water Resources of the Department of Environmental Protection, together with all its functions, powers and duties, is hereby transferred to the authority established pursuant to this act. This act shall not affect the terms of office of, nor the salaries received by, the present officers or employees of the element.

25. The transfer of responsibilities directed by this act shall be made in accordance with the "State Agency Transfer Act," P. L. 1971, c. 375 (C. 52:14D-1 et seq.).

26. This act shall take effect immediately.

C. 58:11-59 et seq.

## P. L. 1981, CHAPTER 347, *approved December 22, 1981*

Senate Committee Substitute for
1980 Senate No. 1614

An Act concerning improvements to the facilities and services of small water companies and supplementing Title 58 of the Revised Statutes.

Be it enacted *by the Senate and General Assembly of the State of New Jersey:*

1. Whenever any small water company is found, after notice and public hearing, to have failed to comply, within a specified time, with any order of the Department of Environmental Protection concerning the availability of water, the potability of water and the provision of water at adequate volume and pressure, which the department is authorized to enforce pursuant to Title 58 of the Revised Statutes, the department and the Board of Public Utilities shall, after notice to capable proximate public or private water companies, municipal utilities authorities established pursuant to P. L. 1957, c. 183 (C. 40:14B-1 et seq.), municipalities or any other suitable governmental entities wherein the small water company provides service, and the Department of the Public Advocate, conduct a joint public hearing to determine: the actions that may be taken and the expenditures that may be required, including acquisition costs, to make all improvements necessary to assure the availability of water, the potability of water and the provision thereof at adequate volume and pressure, including, but not necessarily limited to, the acquisition of the small water company by the most suitable public or private entity. As used in this act, "small water company" means any company, purveyor or entity, other than a governmental agency, that provides water for human consumption and which regularly serves less than 1,000 customer connections.

2. Compensation for the acquisition of a small water company shall be determined:

a. By agreement between the parties, subject to the approval of the Board of Public Utilities, in consultation with the Department of Environmental Protection, and after the holding of a joint public hearing by the board and the department; or,

b. Through use of the power of eminent domain.

3. a. The Department of Environmental Protection and the Board of Public Utilities, upon a determination that the costs of improvements to and the acquisition of the small water company are necessary and reasonable, shall order the acquisition of the small water company by the most suitable public or private entity. This order shall provide for the immediate inclusion in the rates of the acquiring company the anticipated costs of necessary improvements, or, if the determination of acquisition costs has been deferred, as soon as possible thereafter as may be practicable and feasible.

b. The Board of Public Utilities shall extend the franchise area of the acquiring public or private water company to the extent necessary to cover the service area of the small water company taken over pursuant to this act.

4. Any water company, municipal utilities authority, municipality or other suitable governmental entity which receives an order pursuant to section 3 of this act shall acquire the small water company and shall make the necessary improvements to assure the availability of water, the potability of the water and the provision of water at adequate volume and pressure. The small water company shall immediately comply with the order and shall facilitate its sale to the water company, municipal utilities authority, municipality or other suitable governmental entity ordered to acquire the small water company.

5. This act shall take effect immediately.

## Appendix 3

### AGENDA COMMITTEE MEMBERS

**Region 1 - Northeast**

| Member | Affilitation | Interest Represented |
|---|---|---|
| Kenneth Marsh | Lower Raritan 208 | Government |
| Edward O'Connor | Lower Raritan 208 | Civic |
| Carl Klotz | Upper Raritan 208 | Agriculture, Business & Labor |
| Harry Hines | Northeast 208 | Government |
| Robert Kirkpatrick | Passaic River Citizen's Task Force | Agriculture, Business & Labor |
| Lois Hoffman | Passaic River Citizen's Task Force | Civic |
| Katherine Gould | Mercer County 208 | Civic |
| Dave Stybel | Passaic Valley Water Comm. | Water Purveyor |
| Alvin Zach | City of Newark | Water Purveyor |
| George Ferensick | City of Paterson | Government |
| Roy Kucks | Large Water User | Agriculture, Business & Labor |
| Richard Willinger | NJPIRG's Clean Water Action Project | Environmental |
| Frank Oliver | Private Citizen | Environmental |
| Milton Hauser | Large Water User | Agriculture, Business & Labor |
| Ella Filippone | Northeast 208 | Environmental |

**Region II - Ocean and Monmouth Counties**

| | | |
|---|---|---|
| William McCormack | Monmouth County 208 | Environmental |
| William Bobsein | Ocean County 208 | Agriculture, Business & Labor |
| Chris Hoffman | Monmouth County 208 | Civic |
| Ralph C. Hodges Jr. | Ocean County 208 | Government |
| Michael Caponigro | Monmouth Consolidated Water Company | Water Purveyor |
| Walter Holme | Private Businessman | Agriculture, Business & Labor |
| Tom Thomas | Private Consultant | Civic |
| Pat LaRosa | Government | Representing Barrier Islands |

**Regions III & IV - Atlantic, Cape May, Salem and Cumberland Counties**

| | | |
|---|---|---|
| Alvin Steelman | Atlantic County 208 | Environmental |
| James Manetas | Lower Delaware 208 | Agriculture, Business & Labor |
| Alexis Seeley | Lower Delaware 208 | Civic |
| William McLees | Atlantic City Water Dept. | Water Purveyor |
| Richard Hughes | Private Businessman | Business |
| Pat LaRosa | Government | Representing Barrier Islands |

**Region V - Burlington, Camden and Gloucester Counties**

| | | |
|---|---|---|
| Gary Patterson | South Jersey RC&D | Civic |
| Fred Martin | Tri-County 208 | Government |
| Gus Schultes, III | Private Well Driller | Water Purveyor |
| Fran Gudauskas | Private Citizen | Civic |
| Lou Gilde | Large Water User | Industrial |
| William Fleming Jr. | Private Citizen | Environmental |

**Region VI - Northwest**

| | | |
|---|---|---|
| Darryl Caputo | Upper Delaware 208 | Environmental |
| Charlie Miller | Sussex-Warren RC&D | Agricultural, Business & Labor |
| Carolyn Woodward | Mercer County 208 | Government |
| Francis Morrow | Sussex County 208 | Civic |
| Robert Liptak | Garden State Water Co. | Water Purveyor |
| Robert C. Comer | Large Industrial Water User | Agriculture, Business & Labor |
| Wallace W. Whitford | Union Representative | Agriculture, Business & Labor |
| Owen Pool | Farm Bureau | Agriculture |
| John Leoncavallo | South Branch Watershed | Environmental |

Appendix 3

## LOCAL AFFAIRS ADVISORY COMMITTEE

| COUNTY | REPRESENTATIVE |
|---|---|
| Atlantic | Herbert Simmens |
| Burlington | Charles Schiere |
| Camden | Hilliard Moore |
| Cape May | Elwood R. Jarmer |
| Cumberland | Edward Salmon |
| Essex | Francis McCormick |
| Gloucester | Bob Dixon |
| Hudson | Lawrence Campagna |
| Hunterdon | Edmund LaPort |
| Mercer | Eugene Howard |
| Middlesex | Elmer Dieker |
| Monmouth | Frederick C. Kniesler |
| Morris | Ted Pytlar |
| Ocean | Stephen Pollack |
| Salem | Stephen F. Martin |
| Somerset | Frank Facundas Jr. |
| Sussex | Jesse Sohn |
| Union | Thomas W. Long |
| Warren | Charles E. Sickles |

## INTER-AGENCY ADVISORY GROUP

| ORGANIZATION | REPRESENTATIVE |
|---|---|
| Delaware Valley Regional Planning Commission | William Febiger |
| U.S. Department of Agriculture | Richard H. Marston |
| State of Delaware - Department of Natural Resources & Environmental Control | Michael Apgar |
| N.J. Office of Public Advocate | Sandra Ayers |
| County & Municipal Government Study Commission | Robert Curley |
| N.J. Department of Transportation | Andras Fekete |
| N.J. Department of Community Affairs | Richard Ginman |
| Delaware River Basin Commission | Gerald M. Hansler |
| Rutgers College-Department of Environmental Studies | Dr. Robert M. Hordon |
| National Weather Service-Eastern Region | Albert Kachic |
| N.Y. Department of Environmental Conservation | Edward A. Karath |
| U.S. Department of Housing & Urban Development | Marvin Krotenberg |
| U.S. Department of Interior-Geological Survey | Harold Meisler |
| N. . Department of Health | Joseph Nelson |
| N.J. Department of Agriculture | Sam Race |
| Tri-County Regional Planning Commission | Robert Richmond |
| Corps of Engineers-Philadelphia District | D.J. Sheridan |
| N.J. Department of Labor & Industry | John J. Serkies |
| U.S. Environmental Protection Agency | Harry F. Smith, Jr. |
| N.J. Board of Public Utilities | James Murphy |
| Corps of Engineers - New York District | Samuel Tosi |
| Hackensack Meadowlands Development Commission | Nicholas Vallario |
| N.J. Office of Fiscal Affairs | Karl Weber |
| Commonwealth of Pennsylvania - Environmental Resources | John E. McSparran |

## TOP 25 PURVEYORS

| PURVEYOR | COMPANY |
|---|---|
| Tom Cawley | Elizabethtown Water Company |
| Dean Noll | North Jersey District Water Supply Comm. |
| George Haskew | Hackensack Water Company |
| Daniel Berardinelli | Newark Water Department |
| Chester Brozowski | Jersey City Water Department |
| Wendell Inhoffer | Passaic Valley Water Comm. |
| Frank Costabile | Boonton Water Department |
| Donald Carey | New Brunswick Water Department |
| Anthony Scillia | East Orange Water Department |
| Martin Langenoll | Perth Amboy Municipal Utilities |
| William Ferraro | Southeast Morris County MUA |
| Harold Florence | Ridgewood Water Department |
| Thomas Schimmel | Rahway Water Department |
| Frank Boyarski | Parsippany-Troy Hills |
| Ralph Snyder | Hawthorne Water Department |
| Joseph Petrucelli | Orange City Water Department |
| Edward Hughmanic | Toms River Water Company |
| Edward Bastian | Middlesex Water Company |
| William McLees | Atlantic City Water Department |
| Robert Liptak | Garden State Water Company |
| Elbert C. Basolis | Vineland Water - Sewer Utility |
| William Pearce | American Water Works Service |
| Charles D. Bartolomeo | City of Camden |
| Edward R. Yost | Merchantville-Pennsauken Water Commission |
| Frank Schenk | Willingboro MUA |
| Lewis W. Klockner | Trenton Water Department |

Appendix 4

## SOURCE DATA

The background data which was developed by the consultants is recorded in a series of tasks prepared over a period of three and a half years and reviewed by the public at a series of open meetings. These documents, listed below, are available at the library information centers listed in Appendix 4 and should be reviewed to examine detailed analyses, conclusions and recommendations. An asterisk indicates that certain subtasks repork were bound together for the convenience of the reader.

### LIST OF TASK AND SUBTASK TITLES

TASK 1 - DATA BASE OF WATER SUPPLY SYSTEMS AND USE

| | |
|---|---|
| *1A | Collection of Data |
| *1B | Analyze Purveyor Systems |
| *1C | Ranking and Checking of Data |
| *1D | Compile and Present Data |
| 1E1 | Analyze and Define Drought, Withdrawal Limits, Stream Flows |
| 1E2 | Update Interconnection and Transmission Facilities Maps |
| 1E3 | Document and Project Purveyor Deficits |
| 1E4 | Identify Self-Supplied Users |
| 1E5 | Capital Needs Survey |

TASK 2 - NEEDS ASSESSMENT

| | |
|---|---|
| 2A | Trends and Patterns of Populations and Water Use |
| *2B | Problem Summaries for Each Water Supply Region |
| *2C | Analyze Implications of Needs |
| 2D | Recommend a Projections Approach |

TASK 3 - WATER SUPPLY DEVELOPMENT STUDIES

| | |
|---|---|
| *3A | List Available Supply Projects |
| *3B | List Additional Projects |
| *3C | Data Bank to Analyze Alternative Projects |
| 3D | Analyze and Evaluate Alternative Projects |
| *3E | Combine Projects into Programs of Developments |
| *3F | Presentation of Results |
| 3G | Develop Selection Methodology |

TASK 4 - AN INTERCONNECTIONS PROGRAM

| | |
|---|---|
| *4A | Safety and Stability of Supply Systems |
| *4B | Backup Capabilities |
| *4C | Regional Interconnection Needs |
| 4D | Interconnection/Transmission Recommendations |
| 4E | Emergency Response Plan Recommendations |

## TASK 5 - CONTINGENCY PLANS

5A Purveyors' Drought Capacity
*5B Regional Drought Capacity
*5C Formulate a Program to Address Drought Situations

## TASK 6 - CONSERVATION PLANS

6A Formulate Conservation Policies and Programs
*6B Evaluate Significance of Policies and Programs
*6C Develop Conservation Plans

## TASK 7 - WATERSHED RESOURCE MANAGEMENT ACTIVITIES

7A Contents and Methodology for Watershed Resource Management
7B Prepare Watershed Resource Management Plans for Five Basins
7C Prepare Groundwater Management Program

## TASK 8 - REGULATORY SYSTEM MANAGEMENT AND ADMINISTRATIVE ACTIVITIES

8A Accounting of WP & SC Functions
*8B Regulations Governing WP & SC
*8D Procedures for Review, Adoption and Updating of Plans
8C Relationship of PUC and DWR
8E Develop a Small Water Company Program
8F Analyze Potable Water Program
8G Procedure to Cause Water Treatment Facilities to be Built
8H Principles of Major Purveyor Pricing Systems
8I Recommend Water-related Fee System

## TASK 9 - STATE UTILITY OPERATIONS AND ACTIVITIES

9A Compare Institutional Schemes
*9B Analyses of Institutional Schemes
*9D Capital Finance Recommendations
9C Analyses of Alternative Financing Schemes
9E Pricing Schemes for Future Water Supplies
9F Recommend Finance Schemes for Existing Water Supplies

## TASK 10 - LEGAL STUDIES ACTIVITIES

10A Analyze "Grandfather" Diversions or Grants
10B Identify a Comprehensive Diversion Rights Law
10C Possibility of Reserving Diversion Rights for Future
*10D Legal Access to Delaware Basin
*10E Legal Access to Hudson Basin

Amendment No. 1 - Task B - Use of Computer Simulation Model

Appendix 5

## STATEWIDE WATER SUPPLY MASTER PLAN

## INFORMATION CENTERS

| LIBRARY | HOURS |
|---|---|
| **ATLANTIC COUNTY** | |
| Free Public Library<br>Illinois & Pacific Ave.<br>Atlantic City, NJ 08401<br>(609) 345-2269 | M-Th 9-8<br>Fr-S 9-5<br>Sun 1-5 |
| Hammonton Public Library<br>Central & Vine<br>Hammonton, NJ 08037<br>(609) 561-2264 | M-Th-F 10-9<br>Tu-Wed 10-5<br>Sat. 10-1 |
| **BERGEN COUNTY** | |
| Johnson Free Public Library<br>275 Moore St.<br>Hackensack, NJ 07601<br>(201) 343-4169 | M-F 9-9<br>Sat. 9-5 |
| Ridgewood Library<br>125 No. Maple<br>Ridgewood, NJ 07450 | M-F 9-9<br>Sat 9-5<br>Sun 1-5 |
| **BURLINGTON COUNTY** | |
| Burlington County College<br>Pemberton-Browns Mills Rd.<br>Pemberton, NJ 08068<br>(609) 894-9311 Ext. 204 | M-Th 8:30-10<br>Fri 8:30-5 |
| Burlington County Library<br>Woodlane Road<br>Mt. Holly, NJ 08060 | M-F 8:30-8:30<br>Sat 9-5 |
| **CAMDEN COUNTY** | |
| Camden City Free Public Library<br>616 Broadway<br>Camden, NJ 08103<br>(609) 963-4807 | M-Th 8:30-8<br>F-S 8:30-4<br>Sun 1-4 |
| Camden County College<br>Little Gloucester Rd.<br>Blackwood, NJ 08012<br>(609) 227-7200 | M-Th 8-10<br>Fri 8-5<br>Sat 9-2 |
| Camden County Library<br>Reference Department<br>Echelon Urban Complex<br>Voorhees, NJ 08043 | M-F 10-9<br>Sat 10-6<br>Sun 1-5 |

| LIBRARY | HOURS |
|---|---|
| **CAPE MAY COUNTY** | |
| Ocean City Free Public Library<br>6th St. & Ocean Ave.<br>Ocean City, NJ 08226<br>(609) 399-2434 | M-F 9-5<br>& 6:30-9<br>Sat 9-1 |
| Cape May Public Library<br>639 Washington St.<br>Cape May, NJ 08204 | M-F 10-12<br>2-5<br>Th 7-9<br>Sat 10-12 |
| Cape May County Library<br>Main Street<br>Cape May Court House, NJ<br>(609) 465-7111 | M-F 8:45-9:<br>Sat 8:45-4:<br>Sun 1-5 |
| **CUMBERLAND COUNTY** | |
| Cumberland County Library<br>800 E. Commerce St.<br>Bridgeton, NJ 08302 | M-F 10-9<br>Sat 9-5 |
| **ESSEX COUNTY** | |
| Newark Public Library<br>5 Washington St.<br>Newark, NJ 07101<br>(201) 733-7800 | M-W-T 9-9<br>Tu-Sat 9-6 |
| Newark College of Engineering<br>323 High St.<br>Newark, NJ 07102<br>(201) 645-5307 | M-Th 8A-10P<br>Fri 8A-5P<br>Sat 9A-4P |
| E. Orange Free Public Library<br>21 S. Arlington Ave.<br>E. Orange, NJ 07018<br>(201) 266-5600 | M-Th 9-9<br>F 9-5<br>Sat 9-5<br>Sun 1-5 |
| **GLOUCESTER** | |
| West Deptford Free Public<br>Grove Ave. & Crownpoint Rd.<br>Thorofare, NJ 08086<br>(609) 845-5593 | M-F 10A-5P<br>M-Th 7-9<br>Sat 10A-1P |
| Glassboro Public Library<br>Center & High St.<br>Glassboro, NJ 08028<br>(609) 881-0001 | M-F 1-5 &<br>7-9<br>T-F 9-12<br>Sat 10-1 |

| LIBRARY | HOURS |
|---|---|
| HUDSON COUNTY | |
| Jersey City Free Public Library<br>472 Jersey Ave.<br>Jersey City, NJ 07302<br>(201) 435-6262 | M-Th 9-8<br>F 9-6<br>Sat 10-5 |
| Union City Free Public Library<br>324 43rd St.<br>Union City, NJ 07087<br>(201) 866-7500 | M-F 9:30-8:30<br>Sat 9-4:30 |
| N. Bergen Free Public Library<br>8107-13 Bergenline Ave.<br>N. Bergen, NJ 07047<br>(201) 869-4715 | M-Th 10-8<br>F 10-6<br>Sat 10-5 |
| HUNTERDON COUNTY | |
| Lambertville Free Public Library<br>18 York St.<br>Lambertville, NJ 08530<br>(609) 397-0275 | M-F 1-5<br>M-W-F 7-9 |
| Hunterdon County Library<br>Rt. 12<br>Flemington, NJ 08822 | M-F 8:30-8:30<br>Sat 9-5 |
| MERCER COUNTY | |
| New Jersey State Library<br>185 W. State St.<br>Trenton, NJ 08625<br>(609) 292-6237 | M-T 8:30-9<br>T,W,F 8:30-4:30<br>Sat 9-5 |
| MIDDLESEX COUNTY | |
| East Brunswick Public Library<br>2 Jean Walling Civic Center<br>E. Brunswick, NJ 08816 | M-Th 9-9<br>F 9-5<br>Sat 10-5<br>Sun 1-5 |
| Woodbridge Free Public Library<br>George Frederick Plaza<br>Woodbridge, NJ 07095<br>(201) 634-4450 | M-F 9-10<br>Sat 9-5<br>Sun 1-5 |
| Middlesex County College<br>Edison, NJ 08817 | M-T 8-8<br>F 8-5<br>Sat 10-5<br>Sun 1-8 |

| LIBRARY | HOURS |
|---|---|
| **Rutgers University Library of Science and Medicine<br>Piscataway, NJ 08903 | M-Th 8:30-midnight<br>F 8:30-9<br>Sat 9-5<br>Sun 1:30-midnight |
| MONMOUTH COUNTY | |
| Neptune Twp. Public Library<br>25 Neptune Blvd.<br>Neptune, NJ 07753<br>(201) 775-8241 | M,T,Th 10-<br>W,F,S 10-5:30 |
| Freehold Public Library<br>28½ E. Main St.<br>Freehold, NJ 07728<br>(201) 462-5135 | M-F 10-5<br>Sat 10-2<br>M.W.T-7-9 |
| Monmouth County Library<br>Route #35 - Eastern Branch<br>Shrewsbury, NJ 07701<br>(201) 431-7457 | M-Th 9-9<br>F-S 9-5 |
| MORRIS COUNTY | |
| Morris County Free Library<br>30 E. Hanover St.<br>Whippany, NJ 07901 | M-F 9-9<br>Sat 9-5 |
| **County College of Morris Library<br>Rt. 10 & Center Grove<br>Dover, NJ 07801<br>Learning Resources Center<br>(201) 361-5000 | M-T 7:30 A<br>9:45 PM<br>F-7:30 AM -<br>5:00 PM<br>Sat 9-5 |
| OCEAN COUNTY | |
| Ocean County Library<br>15 Hooper Ave.<br>Toms River, NJ 08753 | M-F 9-9<br>Sat 9-5 |
| Lakewood Twp. Public Library<br>2nd St. & Monmouth Ave.<br>Lakewood, NJ 08701<br>(201) 363-1435 | M,W,T 9-8:<br>T-F 9-6<br>Sat 9-5 |

** These colleges will only circulate with their college community, but materials will be available for copy.

| LIBRARY | HOURS |
|---|---|
| **PASSAIC COUNTY** | |
| Wayne Twp. Public Library<br>475 Valley Road<br>Wayne, NJ 07470<br>(201) 694-4272 | Sun 1-5<br>M-F 9-9<br>Sat 9-5 |
| West Milford Municipal Library<br>Ridge Road<br>West Milford, NJ 07480 | M,T,W 12-8<br>Th-Sa 10-5 |
| Patterson Free Public Library<br>250 Broad Way<br>Patterson, NJ 07501<br>201-881-3770 | M 9-9<br>T&W 9-8<br>Th&F 9-6<br>Sa 9-5 |
| **SALEM COUNTY** | |
| Salem City Free Public Library<br>112 W. Broadway<br>Salem, NJ 08079 | T&W 1-8<br>Th 10-8<br>F 1-5<br>Sa 10-5 |
| **SOMERSET COUNTY** | |
| Free Public Library<br>32 S. Maple<br>Basking Ridge, NJ<br>201-766-0356 | M-Th 10-5<br>7-9<br>F 10-5<br>Sat 10-4 |
| Somerset County Library<br>County Administration Bldg.<br>Somerville, NJ | M-Th 8:30-9<br>F 8:30-5<br>Sat 10-5 |
| **SUSSEX COUNTY** | |
| Sparta Twp Free Public Library<br>22 Woodport Rd.<br>Sparta, NJ 07871<br>201-729-3101 | M,W,Th 9-9<br>T,F 9-6<br>Sat 10-1 |
| **UNION COUNTY** | |
| Elizabeth City Free Public Library<br>11 S. Broad St.<br>Elizabeth, NJ 07202<br>201-354-6060 | M-F 9-9<br>Sat 9-5 |

| LIBRARY | |
|---|---|
| Newark State College<br>Nancy Thompson Library<br>Morris Ave.<br>Union, NJ 07083 | M-Th 8A-11:<br>F 8A-10:00<br>Sat 9A-4P<br>Sun 1P-8P |
| **WARREN COUNTY** | |
| Phillipsburg Free Public<br>200 Frost Ave.<br>Phillipsburg, NJ 08865 | M-Th 9-9<br>F&Sun 9-5<br>Sat 1-5 |
| **OUT OF STATE** | |
| U.S. Environmental Protection Agency<br>Region II Library<br>26 Federal Plaza<br>New York, NY 10007 | M-F 8-4:30 |
| U.S. Environmental Protection Agency<br>Region III Library<br>3MA21 - Curtin Bldg.<br>6th & Walnut<br>Philadelphia, Pa. 19106 | M-F 8-4:30 |
| U.S. Environmental Protection Agency<br>Waterside Mall<br>4th & M St. SW<br>Washington, D.C. | M-F 8-4:30 |
| **SUSSEX COUNTY** | |
| Sussex County Library<br>Rd. #3 Box 76<br>Newton, NJ 07860 | |

# New Jersey Statewide Water Supply Master Plan

## UPDATE

August 1983

New Jersey Department of Environmental Protection, Division of Water Resources

# New Jersey Statewide
# Water Supply Master Plan

## UPDATE
## 1983

prepared by:

Water Supply
and
Watershed Management Administration

Division of Water Resources
New Jersey Department of Environmental Protection
1474 Prospect Street
Trenton

Thomas H. Kean, Governor

Robert E. Hughey, Commissioner

John W. Gaston, Jr., Director

Dirk C. Hofman, Deputy Director

# INTRODUCTION
# 1983
# Water Supply Master Plan Update

This constitutes the first update of the New Jersey Statewide Water Supply Master Plan (NJSWSMP). This plan is an instrumental document for managing New Jersey's water resources. It contains our management goals and details of the steps we intend to take now and in the immediate future to meet these goals. To maintain the effectiveness of this resource, the plan must be kept current accurate, for it is a document suitable to revision as situations and technologies change. Thus, the DEP is committed to periodically evaluate changing needs and conditions and, if necessary, to redirect activities or initiate new activities. Furthermore, once every five years, the state will undertake a major revision to the Master Plan. This will include an in depth evaluation of the status of our water supply programs with respect to goals set forth in the Master Plan. Where necessary, the plan will be redirected and current assumptions and projections presented will be revised as deemed appropriate.

The DEP instituted a public participation process that was integral to the development of the SWSMP. The policy of public involvement continues with this first update. On October 19, 1982, a public meeting was held in New Brunswick to solicit public proposals for changes to the Master Plan. All proposals for changes were compiled in a document entitled Items for Consideration in Statewide Water Supply Master Plan Update (November 1982). This document was distributed to persons who expressed interest in the Plan. Six regional meetings were subsequently held in December, 1982 to obtain public comment on these proposals. These comments were compiled in a second document entitled Comments on Items for Consideration in Statewide Water Supply Master Plan Update (January 1983).

The proposed items, numbering 55, were evaluated by the Water Supply Advisory Council and the Office of Water Policy, and a set of recommended changes to the Plan was selected. This material was distributed to persons who expressed interest in the Plan (May, 1983). Five public hearings were subsequently held in June, 1983 to receive comments on the proposed additions and revisions to the Plan. The comments were reviewed by the Office of Water Policy and the final set of modifications to the Plan was prepared. This material is contained within the following pages.

Experience has shown that a set of 5 or 6 hearings is not always the most efficient way to obtain information from the public on topics such as these. In the future, meetings will be scheduled and held in accordance with the issues raised and the interest expressed.

The 1981 Water Supply Bond Act provides the financial means to carry out the proposed items. Details on proposed expenditures for the proposed items and other water supply programs are shown in the revised Table "Action Program 1983 - 86" (Attached).

## Delineation of Water Supply Critical Areas and the Management Aspects of Restrictions on Allocations In Such Areas (Items 1, 2, and 3)

Regulations calling for the creation of water supply critical areas should be adopted by the Department. A water supply critical area would be declared by the Department after it has determined that adverse conditions exist. These conditions may include: (a) shortage of surface water; (b) shortage of groundwater; (c) pollution of an aquifer; or (d) DRBC - controlled area which imposes special requirements not required elsewhere in New Jersey. Within each critical area the State may exercise special controls or require special reports to meet such localized problems when they arise. If a particular area contains more than one condition, actions more restrictive than those imposed to ameliorate a single condition may be required.

These actions may include, but are not limited to: reducing the privilege of a given user to withdraw water in an amount as previously authorized, contracted for, or projected to be required; reducing withdrawals and substituting alternative sources of water; requiring water allocation for all withdrawals of less than 100,000 gpd, but not less than 10,000 gpd; and requiring a degree of water conservation above that required elsewhere. In the case of water supply critical areas of type (d) (not additionally classified as (a) (b) or (c) ) the actions should be only those required by formal actions of the DRBC.

## Feasibility Studies in Cases of Proposed Takeovers of Small Water Companies (Item No. 6)

A large number of small water companies throughout New Jersey are in serious states of disrepair, or otherwise poorly managed, but it is not always clear what steps must be taken to improve their situation. Engineering feasibility studies would be required to establish what improvements must be made to the individual system and the cost of making necessary improvements. By establishing deficiencies early in the process, a sound judgement can be made as to whether or not a system should be taken over, and what the conditions should be. If a takeover is proven to be the best alternative, the feasibility study would recommend who the acquiring party should be and provide the acquiring party with a realistic assessment of needed improvements. This will also serve as the basis for negotiating a realistic time schedule for implementing the takeover and undertaking the improvement.

Funding for such studies would be provided by the 1981 Bond Fund. This is listed under the Action Program 1983 - 86 "Consolidation and Extension of Services".

### Loans for Creating or Upgrading Public Water Supply Systems in Areas of Groundwater Pollution and for the Cost of Acquisition of Inadequate and Obsolete Small Water Systems (Items 7 and 10A)

Under normal circumstances, the creation or upgrading of public water systems or takeover of systems should be a local responsibility. However, when pollution of wells is discovered or small systems are found to be inadequate, some of the localities concerned may be financially unable to support a proper solution.

In the case of hardship, loans will be made for this purpose to municipalities, contingent upon the findings of the Department. A total of $25 million will be earmarked to provide low interest loans for this purpose.

### Funding of Proposed Monksville Reservoir/Wanaque South Project (Items 13, 31, 34)

The State recognizes Monksville as an integral part of the Wanaque South Project at the option of the NJDWSC (North Jersey District Water Supply Commission)*, and it considers both projects to be high priority. In view of the overall benefit which would be created by the Wanaque South Project, funding in the form of a loan under the 1981 Water Supply Bond Act will be provided for the NJDWSC share of the cost of the Wanaque South Project, including Monksville, but excluding treatment facilities. This recommendation is contingent upon the successful conclusion of the procedures to be followed for the analysis of feasibility of major capital water supply projects, prior to requesting appropriation of necessary funds (See NJSWSMP, pages 52-53). The greater part of this work has already been done, but supplementary steps must still be accomplished. For the loans to be awarded, the process as a whole must demonstrate that the project is technically, economically, and environmentally sound, and is acceptable to the public.

### Additional Groundwater Studies (Items 14, 17 and 18)

Additional studies of the groundwater and geohydrology of New Jersey are needed to provide the basic data and understanding of groundwater systems to effectively manage this important resource. To underscore the importance of this activity, the Action Program 1983 - 86 has been revised to allocate $15 million. These additional funds could be used to examine such areas as the Buried Valley Aquifer Systems in northern New Jersey, areas experiencing major groundwater stress or contamination problems in the coastal plain of New Jersey, and the bedrock aquifer formations in the northern half of the State.

---

* and/or the Hackensack Water Company

## Continuous Monitoring of Potable Water Intakes of Larger Water Systems (Item 22)

Continuous monitoring systems at water intakes are useful in detecting high level toxics that cannot be treated through conventional water treatment processes. Such substances can contaminate a water supply through accidental spills, floods, or criminal activity. Presently, only intermittent monitoring is carried out by the individual purveyor and the State, either on a routine basis, or in response to a known contamination incident.

Funding shall be increased for the Special Water Treatment Study by $100,000 to provide for the investigation of continuous monitoring systems. The study shall examine the costs and applicability of alternative technologies and analytical methods, and will recommend those options which would have the greatest utility for the State's water supply systems.

## Low Flow Policy (Item 47)

Critical to the management of New Jersey's water supply is a statement on the intent of the low flow policy. The following is New Jersey's position on this matter. The objective of the State is to provide for environmentally-satisfactory low flows, even under drought conditions, while maintaining essential water supply for all other purposes.

## REVISED

## ACTION PROGRAM 1983-86

| Feasible for Early Implementation by State | Estimated Costs ($ Million) |
|---|---|
| High priority rehabilitation of inadequate water supply systems | 65 |
| Interconnection testing and priority improvements, including: Great Notch & New Brunswick-South River Area | 15 |
| Delaware and Raritan Canal Improvements | 20 |
| Manasquan Reservoir | 40 |
| Additional Water for Northeast Region | 65 (a) |
| Alternatives: | |
| Dunker's Pond<br>Flood Skimming Rockaway River<br>Longwood Valley<br>Monksville<br>Raising Boonton Reservoir<br>Raritan Confluence<br>Raritan-Passaic Conveyance System<br>Six Mile Run and Trap Rock Project<br>Washington Valley | |
| Conservation Program | 1 |
| Watershed and Aquifer Protection - Including Groundwater | 23 (b) |
| Special Water Treatment Study | 0.6 |
| Feasibility Studies for Additional Water Supply Projects | |
| (Including But Not Limited To:) | |
| Evaluation of contaminated well fields and alternative supplies<br>Conjunctive use South River Area<br>Water supply for Camden Metropolitan Area<br>Atlantic City Water Supply<br>Consolidation and Extensions of Service<br>Low flow augmentation Delaware River<br>Lawrence Brook Chain of Lakes restoration<br>Hudson and Delaware main stem projects | |
| Loans for Remedial Work: Polluted wells fields and inadequate small water systems | 25 |
| **Feasible for Early Implementation by Others** | |
| Merrill Creek | 100 (c) |
| Wanaque South | (d) (e) |
| **Other Projects Proposed for Funding but Scope & Cost Need Additional Work** | |
| Water Supply for Camden Metropolitan Area, Recharge and Conjunctive Use S. River Area & Ground Water Investigation & Development | |
| Additional supply projects recommended by feasibility studies | |
| Additional rehabilitation and consolidation of inadequate water supply systems | |

---

(a) Based on current cost comparison within alternative projects. Further evaluations underway.

(b) Including $15 million for ground water studies

(c) Planned for construction by electric utilities

(d) A portion of North Jersey District Water Supply Commission's share may be funded through a loan from the 1981 Bond Act

(e) Cost to be determined

# IMPROVEMENTS
# IN
# NEW JERSEY'S ABILITY
# TO WITHSTAND FUTURE DROUGHTS
# AND WATER EMERGENCIES

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

MAY 30, 1985

REVISED

JUNE 15, 1985

## CONTENTS

Overview..............................................Page 1

Major Water Supply Projects...............................Page 2
    Delaware & Raritan Canal Improvements
    Wanaque South Project Including Monksville
    Manasquan Reservoir Project
    Delaware River Augmentation Projects
    Merrill Creek Project

Drought Emergency Projects................................Page 4
    George Washington Bridge Interconnection
    The Newark-Elizabethtown Interconnection Expansion
    Great Notch Multiple Exchange Facilities
    Delaware and Raritan Canal to Raritan River Connection
    Lake Hopatcong
    Lake Wawayanda

Ground Water Studies......................................Page 6
    Groundwater Study in South River and Vicinity
    Groundwater Study in Camden and Vicinity
    Groundwater Study in Atlantic City and Vicinity
    Groundwater Study in Bedrock Aquifers and Revision of State Geological Map
    Groundwater Study in Buried valley Aquifers

Water Supply Feasibility Studies..........................Page 8
    South River Water Supply Study
    Camden Metropolitan Area Water Supply Feasibility Study
    Atlantic County Water Supply Study
    Statewide Interconnection Study
    Evaluation of Contaminated Wells and Well Fields
    Special Water Treatment Study
    Water Supply for Northeast New Jersey
    County Demonstration Projects

Water Supply Loan Programs................................Page 10
    The Rehabilitation Loan Program
    The Interconnection Loan Program
    The Contaminated Well Field Loan Program

Regulatory Initiatives in Water Supply Management.........Page 11
    General Water Supply Management
    Safe Drinking Water Standards and Testing
    Water Emergency Regulations

Conservation Initiatives..................................Page 14

Appendix 1: 1981 Water Supply Bond Fund Status...........Page 17

Appendix 2: Water Supply Master Plan Status Summary......Page 18

# IMPROVEMENTS IN NEW JERSEY'S ABILITY TO WITHSTAND FUTURE DROUGHTS AND WATER EMERGENCIES

## OVERVIEW

Over the past 20 years, northeast New Jersey was faced with two major drought events that severely impacted the water users in this region and had the potential of having a disastrous impact on the State's economy. In the late 70's the Department of Environmental Protection initiated the Water Supply Master Plan to analyze the State's water supply needs and make recommendations on ways to resolve the various issues confronting the State. As the Master Plan moved forward, the drought of 1980-1982 developed and a number of drought emergency projects were initiated and constructed.

The northeast region of the State is again experiencing drought conditions that may be as severe as those in the droughts of the 60's and early 80's. As a result of the Water Supply Master Plan and various drought emergency projects, the State is today in a better position to deal with a drought emergency. Though better able to handle the effects of a drought, the impact of a continuation of the precipitation trends since August 1, 1984 through 1985 will severely test the water supply systems of northeast New Jersey.

Following the publication of the draft Statewide Water Supply Master Plan in June 1981, the State of New Jersey embarked on a major revamping of its water supply planning, management and development policies. Final adoption of the Master Plan occurred in May 1982.

By statutes, the State's water supply management programs were strengthened and streamlined; a $350 million water supply bond issue was presented to the voters (later approved by them); the N.J. Water Supply Authority was created; and the State's ability to deal with the problems of small water companies was improved. Through the Master Plan itself, a series of projects, programs and feasibility studies were recommended to meet the water supply needs of the State's citizens and industry and a process to be followed in making future water supply project decisions was presented.

In addition, a series of drought emergency projects were initiated in 1981 in response to the Drought of '80 - '82. This report presents the various projects recommended and implemented over the past 4 years and other relevant information.

## MAJOR WATER SUPPLY PROJECTS

The water supply projects recommended in the Master Plan and their current status are given below. These projects will greatly expand water supply available to New Jersey at a total capital cost of more than $500 million. These projects represent the largest capital commitment to new water supply in New Jersey in the last 40 years.

### Delaware & Raritan Canal Improvements

This project, which involves dredging the canal and rebuilding certain canal facilities, will restore the 100 MGD capacity to the canal so New Jersey will be able to take its full entitlement from the Delaware River for use outside the Basin in accordance with the Supreme Court Decree of 1954. Prior to rehabilitation the canal capacity had shrunk to 12 MGD in critical periods of the year, and water sales contracts are currently limited to 75 MGD. Project cost is $20.55 million. The project is under construction and due to be completed in the fall of 1985.

### Wanaque South Project Including Monksville

This project, which will increase the safe yield for sections of northeastern N.J. by 79 MGD, is being funded partially by the Hackensack Water Company and partially by the North Jersey District Water Supply Commission (NJDWSC). The NJDWSC share of the project, less the treatment facilities, is approximately $50 million and is expected to be funded through loans from the 1981 Water Supply Bond Act. This project consists of: two pump stations, one on the Ramapo River and one at the confluence of the Passaic and Pompton Rivers; aqueducts connecting the Ramapo and confluence pump stations with NJDWSC's Wanaque Reservoir; an aqueduct connecting the Wanaque Reservoir with the Hackensack Water Company's Oradell Reservoir; and the Monksville reservoir which will expand storage of the Wanaque system by 7 billion gallons to 43 billion gallons. The total project cost is $151 million. The aqueduct between Wanaque Reservoir and Oradell Reservoir is completed; the pump station on the Ramapo River is completed; the remainder of the project is under construction and due to be completed in Spring 1986; the Monksville Reservoir portion will not be complete until early 1987.

### Manasquan Reservoir Project

This project will provide 31 MGD in new safe yield for the Monmouth and northern Ocean County area. It consists of: an intake facility on the mainstem of the Manasquan River near the Garden State Parkway; a storage reservoir in the upstream portion of the watershed; and a force main linking the two. Cost is approximately $72 million and will be financed through loans from the 1981 Bond Act.

Consultant studies will soon be submitted to the Department for final review. If the review process by the U.S. Army Corps of Engineers and the Department are completed on schedule and the project is approved, it could be completed in 1990.

### Delaware River Augmentation Projects

The problem of salt water migrating upstream in the Delaware River mainstem during periods of low stream flow creates a serious need for new low flow augmentation storage in the lower basin. New Jersey shares responsibility for addressing this problem under the DRBC "Good Faith" agreement. Since it was determined that the Hackettstown Reservoir project is not economically viable, the State has agreed to negotiate with the other Lower Delaware Basin States to jointly finance the proposed modification of the existing F.E. Walter and Prompton Reservoirs in Pennsylvania to provide for such storage. The U.S. Army Corps of Engineers is conducting feasibility studies of the F.E. Walter Reservoir and funds are being sought to begin study of the Prompton modification project. Estimated construction completion time for the F.E. Walter Project is 1991 with the Prompton Reservoir Modification to follow. Total project cost is estimated at $159 million.

### Merrill Creek Project

To provide make up water for electric power plant evaporation losses and to supplement low flows in the Delaware River, the Merrill Creek Reservoir project in Warren County is being planned and financed by a group of power companies. The Delaware River Basin Commission and NJDEP have concluded their hearing processes regarding the project and the State stream encroachment, dam and diversion permits could be issued by June. The yield of this project is 200 CFS for 115 days. Merrill Creek is scheduled to be completed by 1987. Its estimated project cost is $217 million. Financing will be furnished by the Electric Utilities User Group.

## DROUGHT EMERGENCY PROJECTS

The projects discussed below were recommended in 1980 by the NJDEP. Their construction was funded through drought emergency loans from the State, which are scheduled to be paid back by the purveyors.

In addition to these State supported projects, improvements in transfer capabilities were independently completed by several purveyors with their own funds. These include interconnections between: the Commonwealth Water Company and the Passaic Valley Water Commission; and the Jersey City Water System and the Hackensack Water Company.

### George Washington Bridge Interconnection

This project involved construction of a pipeline across the George Washington Bridge to link the New York City water supply system on one end and the Hackensack Water Company system on the other. This allows the "wheeling" of a portion (up to 20 MGD) of New Jersey's Delaware River basin allocation through the New York City Delaware Basin aqueducts into New York City and thence across the bridge. The cost was $5.3 million.

The facilities at either end of the bridge are permanently maintained and the pipeline on the bridge was disassembled after the drought of 1980-82. It can be reassembled in 2 to 3 working weeks, although current sidewalk repair work could extend this time.

### The Newark-Elizabethtown Interconnection Expansion

This project involved the expansion of existing interconnection capacity between the Newark water system and the Elizabethtown Water Company from the 10-15 MGD to 30-35. It was a three-part project. The Linden Street pipeline was completed in January 1982 and is operational. The Virginia Street pump station was completed in July 1982 and is operational. The rehabilitation of Newark's 60" transmission line was completed in 1982 and the line is operational. The cost of these facilities was $6.4 million.

### Great Notch Multiple Exchange Facilities (Chittenden Road and Wayne Pump Stations and connections)

The aqueducts of four major water purveyors run through the Great Notch and converge within close proximity to one another. The four purveyors are the Jersey City Water Division, the Newark Water Department, the North Jersey District Water Supply Commission and the Passaic Valley Water Commission.

The Chittenden Road pump station and interconnection links Newark, Jersey City and Passaic Valley aqueducts with varying transfer capabilities of 15 MGD to 45 MGD. It was completed in April 1983 and limited testing and operation has taken place since then. Full testing will be done in the near future.

The Wayne pump station and interconnection increased transfer capability between Newark and the North Jersey District from 25 MGD to 50 MGD. It was completed in October 1982 and is fully operational. The cost of both these facilities was $2.5 million.

### Delaware and Raritan Canal to Raritan River Interconnection

This project involved the construction of a pump station on the Raritan River and a discharge line to the D & R Canal. This will enable 60 MGD to be transferred from the Round Valley - Spruce Run Reservoir System to canal customers. This facility which cost approximately $ 500,000, is complete and is being utilized now while the canal is being dredged.

### Lake Wawayanda Pipeline

This project covers the reactivation of an existing 20 inch and 24 inch diameter pipeline to transfer 10 MGD of water from Lake Wawayanda to the City of Newark's Canistear Reservoir located in the Pequannock River Basin. Approximately $400,000 and two weeks are needed to make this pipeline operational. This will involve the replacement of the diesel powered pump station and testing (and possible rehabilitation) of the 20 and 24 inch diameter cast iron pipe.

### Lake Hopatcong Pipeline

The Lake Hopatcong pipeline is an emergency interconnection for the transfer of water from Lake Hopatcong to the Rockaway River which flows into the Boonton Reservoir. The 30 inch ductile iron pipe is still in place and runs both above and below ground. The concrete pump station pad remains intact. A $600,000 contract was signed by the New Jersey Water Supply Authority with Camp, Dresser and McKee to: 1) rehabilitate the pumps (i.e. replace the old motors with new ones, preferably electric) and 2) evaluate the feasibility of replacing the old gravity line in the lake with a suction line. Construction started on May 28, 1985.

## GROUND-WATER STUDIES

The Water Supply Master Plan included several aquifer studies to evaluate ground-water supply capabilities in several areas. Also included is a revision of the State's 73 year old geologic map to indicate aquifer potential and vulnerability. A total of $15 million has been earmarked for these projects which began in 1983.

### Ground-water Study in Vicinity of South River and Northwestern Monmouth

Over-use of ground water in the Old Bridge and Farrington aquifers underlying eastern Middlesex and northern Monmouth Counties has caused a large cone of depression. Salt water intrusion has occurred in the vicinity of Sayreville and Keyport-Union Beach. Joint USGS-DWR (Geological Survey) studies began in 1983, utilizing '81 Water Bond funds. Water use and stream flow data has been collected to determine past, present and potential streamflow and ground water diversions since the largest ground-water recharge projects in the State are in the Sayreville area. Geophysical work began in 1985 to define the bedrock surface especially the buried palisades, which is the lowermost boundary of the aquifers. Data will be utilized by an on-going water supply feasibility study.

### Ground-water Study in Camden and Vicinity

Large ground water diversions have caused water levels to decline over 100 feet in the Camden-Cherry Hill area resulting in infiltration from the Delaware River and accelerated movement of a salt water front in the Potomac-Raritan-Magothy aquifer. In 1983 a joint USGS-DWR (Geological Survey) study began, utilizing '81 Water Bond funds. Several new observation wells were drilled in 1984 and interpretation of hydrogeologic data continues. Additional wells and seismic lines are planned for 1985-86 to define the geometry of the hydrogeologic units. Data will be utilized by on-going water supply feasibility studies.

### Ground-water Study in Atlantic City and Vicinity

Diversions from the Kirkwood aquifer have caused water levels to decline over 90 feet in the vicinity of Atlantic City with the subsequent possibility of salt water intrusion. In order to better manage this resource a joint USGS-DWR (Geological Survey) study was initiated in 1983 utilizing 1981 Water Bond funds. Many miles of deep seismic lines were run during 1984 and 1985. A contract has been awarded to drill 2 wells offshore, in 1985, to define the salt water - fresh water interface. Data will be utilized by on-going water supply feasibility studies.

## Ground-water Study in Bedrock Aquifers

Much of northern New Jersey is dependent upon ground water from bedrock aquifers. As the population expands westward, rural areas develop competition for large quantities of ground water from these aquifers. An agreement has been initiated between the USGS and DWR (Geological Survey) to revise the 1912 State Geological Map as the first step in defining the bedrock aquifers. Funding from the '81 Water Bond has provided staff for the DWR/Geological Survey which is being matched by USGS. The new geologic map will indicate the most important aquifers and the areas most vulnerable to contamination.

## Ground-water Study in Buried Valley Aquifers

The buried valley aquifers of northern New Jersey are among the most important ground water resources in the State. Many public water supplies draw from these narrow, poorly defined aquifers and competition for water is increasing, especially in Morris, Passaic and Essex Counties. The DWR-Geological Survey has completed a geophysical study of the Ramapo Valley in 1984 and will complete a bedrock map of the Upper Rockaway in 1985. Funding for these studies has been through an EPA grant supplemented by '81 bond monies. DWR (Geological Survey) and USGS will put a much greater effort into mapping these valleys upon completion of the Atlantic City, Camden and South River studies.

## WATER SUPPLY FEASIBILITY STUDIES

Through the Statewide Water Supply Master Plan, New Jersey has coordinated its entire water supply program and is addressing long term needs through a coordinated effort of project planning and implementation. It is this approach that will give New Jersey the ability to prevent significant impacts from drought in the future. A number of studies and programs have been initiated to analyze problem areas identified in the Master Plan.

### South River Water Supply Study

The South River Basin in central New Jersey has been established by the New Jersey Statewide Water Supply Master Plan as a priority water supply area warranting immediate study to determine the extent of critical water supply problems and to propose feasible solutions. The South River area is primarily dependent on ground water supplies. This source's viability has become increasingly threatened by saline intrusion and by contamination from landfills, septic tanks and other sources. This, combined with heavy ground water withdrawals, has led to localized supply shortages.

The study will be closely coordinated with an ongoing, State sponsored, U.S. Geological Survey ground water modeling study of major aquifers in the South River area as well as State interconnections and aquifer protection programs.

### Camden Metropolitan Area Water Supply Feasibility Study

The Master Plan proposed a water supply feasibility study to recommend a solution to the water supply problems of the Camden metropolitan area. This study is evaluating a number of alternatives including ground water from the Cohansey aquifer; transfer of surface water from the City of of Philadelphia; relocation of Camden's well fields; and a direct surface water intake on the Delaware mainstem. The study will be completed in December of 1985.

### Atlantic County Water Supply Study

This study will address the water supply distribution system and resources of the Barrier Island communities and coastal mainland. It will assess the impact of casino development upon those systems and determine the long-term needs of the region. One of the main concerns is the overdependency of the island communities upon the Kirkwood Aquifer which may ultimately be subject to salt water intrusion.

## Statewide Interconnection Study

Interconnections are the physical means by which water may be transferred from one system to another. They are a critical component of an overall drought planning strategy. The purpose of this study is to develop a State interconnection program, a priority list for recommended interconnection projects, and a compilation of data on existing interconnections.

## Evaluation of Contaminated Wells and Well Fields

In areas where groundwater contamination forces the discontinued use of wells there exists a need for rapid implementation of an alternative source of potable water. To assure a rapid solution in these emergency conditions, while remaining consistent with prudent long range planning, a program was developed for responding to polluted wellfield cases.

Under this program, seven major consultants have been contracted to respond to Department requests for project cost evaluations. This program is designed to recover use of groundwater resources whenever practical to reduce additional demands upon surface supplies. The program dovetails with Spillfund and Superfund financing where applicable, to enhance rapid construction schedules.

## Special Water Treatment Study

The Water Supply Master Plan called for special water treatment studies to investigate methods of treatment to remove the new classes of pollutants being found in drinking water, some of which are carcinogenic. The first step was a preliminary consultant contract, which made a general survey of the types and occurrence of contaminants, and of the treatment methodologies available, and outlined the scope of a more detailed study to follow. After advertisement, a contract for the later study is now to be awarded to Camp Dresser and McKee at a price of $494,893. The consultant started work in May 1985. This contract will emphasize treatment methods and available equipment for small purveyors and individual homes, especially for groundwater. The increasing occurrence of well contamination has increased the urgency of this work.

## Additional Water Supply for Northeast New Jersey

The Master Plan recommended that a feasibility study be done, in conjunction with an analysis of safe system yields, to determine what the next authorized project should be for northeastern New Jersey. This study concluded that on the basis of revised population and water demand projections for northeastern New Jersey, the construction of the Wanaque South Project, and emergency water supply projects constructed during the drought of '80 - '82, no major new projects were needed in northeastern New Jersey at this time.

## County Demonstration Projects

These are a series of projects being tested by county agencies which are designed to preserve and protect groundwater aquifers and watersheds. These programs will be expanded and applied statewide when shown to be successful during testing at the county level.

## WATER SUPPLY LOAN PROGRAMS

The action program of the Water Supply Master Plan specifies as a high priority the rehabilitation of inadequate and deteriorating water supply transmission/distribution facilities, interconnection improvements, and evaluation of contaminated wellfields and alternative supplies. There three action elements ultimately led to the development of the Water Supply Bond Loan Program to administer funds and complete projects in close cooperation with local governmental units. A total of $65,268,000 has been appropriated for the loan program.

## The Rehabilitation Loan Program

This program provides low interest loans to qualifying municipalities and utility authorities for the rehabilitation or repair of antiquated, obsolete, damaged, or inadequately operating water supply distribution facilities. The goal of the rehabilitation loan program is to financially assist local units in their efforts to minimize leakage in their water systems and to render their systems more efficient. Currently, the program is in receipt of 60 rehabilitation loan applications requesting a total of $45,428,424. Of this total, loan funds in the amount of $15,430,984 are committed to 28 of the applicants.

### The Interconnection Loan Program

This program provides low interest loans to qualifying municipalities and authorities who are interested in constructing or improving interconnections between their water distribution system and other systems. The loans are awarded on a priority basis, with increasing the ability to continue service during a drought as the main goal.

### The Contaminated Well Field Loan Program

This program was developed to provide low interest loans to communities with contaminated wellfields that are not eligible for funding through the Spillfund or Superfund programs. The program assures communities an opportunity to finance projects that meet both emergency response and long term planning needs. Early participants in this program include the Townships of Edgewater Park, Upper Deerfield, Delanco, and Stafford.

## REGULATORY INITIATIVES IN WATER SUPPLY MANAGEMENT

### General Water Supply Management Regulations

The Water Supply Management Act of 1981 required the Department of Environmental Protection to assume major new responsibilities for managing the water supplies of the State. Initial implementation included setting up a system of water allocation permits (and water certifications for agricultural users) to replace the activities of the Water Policy and Supply Council. These new procedures are now fully operational with backlogs eliminated. More recently, in February 1985, the general water supply management regulations were published, which encompass two principal activities:

- The establishment and implementation of water supply critical areas.
- Direct management controls over all 631 public water supplies in the State.

The water supply critical areas progrm will institute necessary management controls where severe regional problems exist, particularly depleted and threatened groundwater aquifers. The first critical area, in Monmouth County and parts of Middlesex and Ocean Counties, was proposed promptly and is expected to be operational about June 1, 1985. All major users will be required to reduce withdrawals to a level corresponding to the dependable yield of the depleted aquifer. However, in order to effect this reduction, alternative sources of water will be provided, which in this case will include the proposed Manasquan Reservoir. Each user will be allowed until January 1987 to decide which alternative water supply method they will utilize, including the increased use of water conservation. The second and third critical areas are expected to be the Camden Metropolitan Area and Atlantic County, respectively, to be initiated by the end of 1986.

The management controls to be initiated throughout the State under the new regulations include:

- Management reports by the larger companies, to include programs and capital plans for system maintenance and rehabilitation.
- Provision by each system for a safe yield of water equal to its total needs.
- Reports on "unaccounted-for" water and corrective actions proposed to reduce wastage and promote water conservation.
- Provisions for adequate system storage and interconnections with adjacent systems, to prepare for emergencies.
- Preparation of conservation plans as a condition of allocation permits.

## Revisions to Safe Drinking Water Act

Bill A-280, which became law in January 1984, initiated a major extension of the State's program for safe drinking water, particularly directed at a class of contaminants referred to as volatile organics. Basically, the act requires:

- A program to certify laboratories for the testing of this class of substances

- A testing program, by which all public water supplies must complete initial testing by January 1985, and semiannually thereafter.
- The appointment of the members of the Drinking Water Quality Institute, which is charged with establishing maximum contaminant levels for volatile organics and other contaminants, which shall then be implemented by the Department. The Institute has been appointed and has started its work of setting maximum contaminate levels.

The Department has been vigorously implementing these objectives. A sufficient number of laboratories have now been certified, and almost all of the public water suppliers have submitted results of their initial round of tests. The Department is taking remedial action as appropriate in approximately 30 cases where sampling has indicated more than nominal concentrations of contaminants.

No issue is more important to the public at large than the quality of drinking water. 1985 will be a year of dramatic forward progress in understanding more about drinking water quality, and related actions needed to maintain or restore quality.

## Water Emergency Regulations

The Emergency Water Supply Allocation Plan (EWSAP) Regulations and the Water Emergency Surcharge Schedule (WESS) Regulations were adoption 1985. The major purpose of these regulations is to provide the Governor and the Commissioner of the Department of Environmental Protection with an improved ability to manage the water resources of the State during water emergencies.

The EWSAP Regulations (N.J.A.C. 7:19A) establish a four-phase priority system for the order in which restrictions shall be imposed upon various categories of water use according to the severity of the emergency. The rules provide for Phase 1: restrictions on adjustable water uses; Phase 2: rationing of water; Phase 3: curtailment of industrial and commercial operations; and Phase 4: industrial and commercial shutdowns.

The Water Emergency Surcharge Schedule (N.J.A.C. 7:19B) was adopted at the same time as EWSAP. The purpose of the water surcharge schedule is to promote conservation of dwindling water resources. The water Emergency Surcharge Schedule provides for an allocation of 50 gallons per person per day for residential water users. Usage above this level will incur a $5.00 surcharge over the normal rate for each 100 cubic feet of water or portion thereof. The 50 gallon allocation is based on a 25% reduction from an average daily indoor use of about 65 gallons per person. Non-residential users will pay a rate of 1.33 times the rate normally charged. A conservation fact of of 25% will allow the user to realize no increase in his/her water bill.

## CONSERVATION INITIATIVES

A comprehensive water management program requires an aggressive set of conservation initiatives to be complete. The Department in conjunction with other agencies of state and local government has assembled a series of programs directed at conserving water use through intelligent management. Several activities have been discussed earlier in this report. However, for completeness, some will be mentioned again, along with other significant water conservation initiatives.

The Department's regulatory program for Water Supply Management involves three specific activities that have a direct bearing on water conservation. First the critical areas program which is directed at reducing ground-water dependency. One way to reduce critical area water needs is through an aggressive and successful conservation program. Water which is saved lowers overall demand and may be enough to provide for compliance with water use reduction requirements.

The second major regulatory thrust involves identification of "unaccounted for " water. The General Management Regulations require each purveyor to analyze and report the amount of "unaccounted for" water and to institute a management program to reduce leakage and water losses. A reduction in the amounts of "accounted for" water provides additional resources for growth in the future or the replenishment of stressed aquifers.

Finally, individual water allocation permits have specific conditions that require conservation plans to be developed and implemented by purveyors. Guidelines for required plans have been prepared by department staff.

Each of these regulatory initiatives will provide for immediate as well as long term incentives to accomplish water conservation and reduction. These programs are required by the General Management Regulations and represent a significant commitment on the part of the State to have on-going and permanent conservation measures in place.

In support of the regulatory initiatives discussed above, the water supply rehabilitation loan program has been created. This program provides the financial means to conserve water through upgrading and rehabilitation. Implementation of these regulatory programs which are directed at reducing water usage will provide incentives for a larger number of communities to apply for the rehabilitation loans.

Another avenue by which water conservation has been implemented involves legislation which modified the Uniform Construction Code to require water saving fixtures for all residential construction repairs. New construction already required water saving fixtures. Eventually all fixtures must be replaced, and when they are, low use fixtures will be utilized. The Department of Community Affairs was responsible for modifying the Uniform Construction Code to accomplish this important conservation initiative.

The Department of Energy through the Board of Public Utilities has mandated that major energy utilities provide energy "and water conservation" fixtures at nominal cost and on an installed basis. Notices and order forms have been sent to customers which provide a convenient means by which such fixtures can be ordered and installed by professional contractors.

The Department of Environmental Protection has also created an Office of Water Conservation. This office has been founded as a central location for receiving, channeling, and disseminating conservation information. The office has been responsible for preparing conservation flyers for general distribution and it has been working on proposals for water conservation seminars. It has also prepared a statewide water conservation curriculum for use in public schools, and a conservation manual for the landscaping and nursery industry in New Jersey. The office has stepped up its activities as a consequence of the drought of 1985. Other departments are also cooperating, through the Water Emergency Task Force, in the distribution of information and the implementation of water saving techniques at the State and local levels of government.

Finally, statewide water use in the industrial sector has been significantly reduced as a result of the higher cost of energy and significantly higher costs for processing and disposing of wastewater and hazardous materials. An aggressive NJPDES permit program along with Federal and State RCRA programs have caused industrial facilities to devise ways to eliminate or minimize the amount of water that must be discharged as waste. Companies recognize there is money to be saved by the efficient and prudent use of water and energy needed to heat water. Through recycling and through process changes, the industrial sector has moved significantly to reduce water consumption in the last five years. This is expected to be a long term trend, since the regulation of waste products and the liability for improper disposal of waste products will only increase in the future.

When taken as a whole, the above initiatives demonstrate a firm commitment on the part of the state to see that water conservation is a major factor in our overall water supply management program.

## 1981 Water Supply Bond Fund Status

APPENDIX 1

| ACTION PROGRAM ELEMENTS | Original Appropriation | Committed | Available |
|---|---|---|---|
| 1983 Assembly Bill No. 1516 | | | |
| Rehabilitation Loas & Consolidation Inadequate Water Supply Systems | 25,000,000 (1)* | 15,866,342 | 9,133,658 |
| Conservation Program | 500,000 | 54,992 | 445,008 |
| Watershed & Aquifer- | 3,000,000 | 2,712,026 (2)* | |
| State Activities | | | |
| USGS Contract (C-29438) | | | 287,974 |
| USGS Contract (C-29254) | | | |
| Watershed & Aquifer-Long Range Study | 400,000 | 350,755 | 49,245 |
| Watershed & Aquifer-County Programs | 1,300,000 | 1,300,000 | -0- |
| Watershed Aquifer - Stormwater Mgt. | 50,000 | -0- | 50,000 |
| Special Water Treatment Analysis | 600,000 | 600,000 | -0- |
| Feasibility Studies | 4,500,000 | | 248,443 |
| State Activities | | 712,371 | |
| Contaminated Wellfields | | 1,500,000 | |
| South River Regional Water Proj. | | 400,000 | |
| Camden Metro. Area Water Supply | | 550,000 | |
| Safe Yield Analysis | | 239,186 | |
| Atlantic County Water Supply | | 850,000 | |
| 1983 Assembly Bill No. 1513 | | | |
| Interconnection Testing and Priority Improvement Loans | 7,500,000 | 96,591 (3)* | 7,403,409 |
| 1983 Assembly Bill No. 1512 | | | |
| D & R Canal | 15,000,000 | 15,000,000 | -0- |
| 1984 Assembly Bill No. 1603 | | | |
| D & R Canal | 5,550,000 | 5,550,000 | -0- |
| 1985 Assembly Bill No. 2267 | 51,603,000 | 11,415,150 | 40,187,850 |
| TOTAL APPROPRIATIONS | 115,003,000 | 57,197,413 | 57,805,587 |
| Appropriation Pending | | | |
| Wanaque South | 50,000,000 | 50,000,000 | -0- |
| Manasquan Reservoir | 72,000,000 | 72,000,000 | -0- |
| Total Appropriated plus Pending | $237,003,000 | $179,197,413 | $57,805,587 |

*(1) Applications received $45,351,484

*(2) Includes DEP geological work on projects

*(3) DEP developing Interconnection Study to identify needs in the state

NOTE: $179,197,413 of $350,000,000 Bond Act has been committed or expended.

APPENDIX 2

WATER SUPPLY MASTER PLAN STATUS SUMMARY

(ACTION PROGRAM 1983-86)

| Feasible for Early Implementation by State | Estimated Costs ($ Million) | Status |
|---|---|---|
| High priority rehabilitation of inadequate water supply systems | 65 | Initiated |
| Interconnection testing and priority improvements, including: Great Notch & New Brunswick-South River Area | 15 | Initiated |
| Delaware and Raritan Canal Improvements | 20 | Construction (1986) (2) |
| Manasquan Reservoir | 40 | Planning (1990) (2) |
| Additional water for Northeast Region | 65 (a) | Study Complete |
| Alternatives: | | |
| Dunker's Pond | | Not Needed |
| Flood Skimming Rockaway River | | Not Needed |
| Longwood Valley | | Corps Study |
| Monksville | | Construction (1987) (2) |
| Raising Boonton Reservoir | | Not Needed |
| Raritan Confluence | | Detailed Study (1985) |
| Raritan-Passaic Conveyance System | | Not Needed |
| Six Mile Run and Trap Rock Project | | Detailed Study (1985) |
| Washington Valley | | Local Planning |
| Conservation Program | 1 | Initiated |
| Watershed and Aquifer Protection - Including Groundwater | 23 (b) | Initiated |
| Special Water Treatment Study | 0.6 | Initiated |
| Feasibility Studies for Additional Water Supply Projects (Including But Not Limited To:) | | |
| Evaluation of contaminated well fields and alternative supplies | | Contracts Awarded |
| Conjunctive use South River Area | | Initiated |
| Water Supply for Camden Metropolitan Area | | Initiated |
| Atlantic City Water Supply | | Initiated |
| Consolidation and Extensions of Service | | Future Study |
| Low flow augmentation Delaware River | | PA Reservoirs |
| Lawrence Brook Chain of Lakes restoration | | Detailed Study (1985) |
| Hudson and Delaware main stem projects | | PA Reservoirs |
| Loans for Remedial Work: Polluted wells fields and inadequate small water systems | 25 | Initiated |
| **Feasible for Early Implementation by Others** | | |
| Merrill Creek | 100 (c) | Construction (1988) (2) |
| Wanaque South | (d) (e) | Construction (1987) (2) |
| **Other Projects Proposed for Funding but Scope & Cost Need Additional Work** | | |
| Water Supply for Camden Metropolitan Area, Recharge and Conjunctive Use South River Area & Ground Water Investigation and Development | | Later |
| Additional supply projects recommended by feasibility studies | | Later |
| Additional rehabilitation and consolidation of inadequate water supply systems | | Later |

---

(a) Based on current cost comparison within alternative projects. Further evaluations underway.
(b) Including $15 million for ground water studies
(c) Planned for construction by electric utilities
(d) A portion of North Jersey District Water Supply Commission's share may be funded through a loan from the 1981 Bond Act
(e) Cost to be determined

---

(1) Source: 1983 update, Water Supply Master Plan
(2) Dates are estimated completion of construction
(3) Detailed study to be initiated fall of 1985

State of New Jersey
JOHN W. GASTON, JR. P.E.
DIRECTOR
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
CN 029
TRENTON, NEW JERSEY 08625
DIRK C. HOFMAN, P.E.
DEPUTY DIRECTOR

# MEMORANDUM

TO THOSE INTERESTED IN PROPOSED WATER SUPPLY CRITICAL AREA NO. 1

The draft management procedures proposed for application in Water Supply Critical Area No. 1 have been revised after consideration of comments received at the four public hearings held on this subject and letters submitted after the hearings. Attention is invited to the fact that a change has been made in one of the previously circulated maps, dealing with the lower aquifer (PRM). A revised draft of the procedures dated June 13, 1985 is enclosed, also a Response Document, giving reasons for the changes made and also reasons for not accepting other comments.

It is proposed now to establish this critical area including the map and procedures, under provisions of regulations cited.

If any person wishes to comment further on this proposal, the comment should be made within two weeks after the date of this letter, addressed to:

Mr. John W. Gaston, Jr., Director
Division of Water Resources
Department of Environmental Protection
P.O. Box CN-029
Trenton, New Jersey 08625

W. W.

WW:bs

New Jersey Is An Equal Opportunity Employer

# RESPONSE DOCUMENTS

# ESTABLISHMENT OF WATER SUPPLY CRITICAL AREA NO. 1

June 13, 1985

Contents:

- General ________ 1
- Public Hearings ________ 1
- Letters subsequent to Public Hearings ________ 6
- General Summary ________ 11
- Maps ________ a-e
- Revised Procedures ________ 1-6

Division of Water Resources
Dept. of Environmental Protection
Trenton, New Jersey 08625

GENERAL:

Under the provisions of the General Water Supply Management Act Rules (NJAC 7:19-6.0-6.13) four public hearings were conducted with the purpose of establishing Water Supply Critical Area No. 1, in portions of Middlesex, Monmouth and Ocean Counties. At the first two hearings, boundaries and general scope of the proposed critical area were discussed. At the second two hearings proposed detailed procedures were discussed. Further time was allowed for written comments. In addition to the hearings, public meetings were conducted with citizen's advisory groups in two areas, and maps and draft procedures were sent to a mailing list of 1200 persons. These procedures are an adaptation to the specific area of the applicable provisions, appropriately modified as a result of the public participation process, be adopted. This response document deals with various comments relative to proposed procedures, and give reasons why the various changes suggested should or should not be adopted.

PUBLIC HEARINGS

There were four public hearings conducted as follows:

May 13, 1985
Edison Science Building
Monmouth College
Cedar Avenue
West Long Branch, New Jersey 07764

May 14, 1985
Middlesex County Planning Board
Room 102, West Hall
Mill Road
Edison, New Jersey 08817

April 9, 1985
Auditorium
Howell High School
Squankum-Yellow Brook Road
Farmingdale, New Jersey 07727

April 11, 1985
East Brunswick Public Library
Jean Walling Civic Center
Ryders Lane
East Brunswick, New Jersey 08816

There were no requests for changes in the critical area boundaries except for one point which is covered in the discussion which follows. Accordingly the boundaries, including marginal areas, remain as originally proposed, except that, based on later information from the U.S. Geological Survey, an additional depleted area has had to be included on the map for the lower PRM aquifer.

April 9th Hearing

Mr. Eric Foster, Freehold Borough Council, asked that the slower growing communities be allowed to retain their full withdrawal rights. (leaving reductions to be made by others)

RESPONSE

This cannot be done. However, the faster growing communities will automatically be required to purchase more of the expensive replacement water, as their needs grow.

Mr. William Pearce, Monmouth Consolidated Water Company, supports the critical area approach.

Mr. Howard Woods, New Jersey Water Company, considers that the Raritan Bay area should be dealt with first, and areas in Ocean County and southern Monmouth be considered at a later date. However, he supports the critical area procedures generally.

RESPONSE

In effect, the southern area may be affected later, because the Manasquan Project water will not be available until 1990, whereas some of the South River alternatives will be available this year. In each case action will be dependent on the date alternatives can be made available.

May 13th Hearing

Senator S. Thomas Gagleaino (by letter) and Mr. Ted Narozanick, favor the proposed procedures, but request that a formula by which water use by farmers can be increased in line with the severity of the drought.

RESPONSE

The amount of water allowed by water certifications to farmers is set by agricultural agents as the need during a severe drought; at other times in order to minimize energy costs farmers use less. In line with the principle that all must share equitably in the costs of replacement water, farms, like other users, will have to pay for a portion of surface water. There is no thought of denying farmers water they need for irrigation.

Mayor Richard Bergen of Keyport stated that Keyport made a large investment in a water supply about 1978 including a treatment plant. He feels that the new critical area procedures will entail additional expense for an outside water supply while still paying for the original investment.

RESPONSE

The reason why Keyport made a large investment was that in 1977 it was forced to abandon three wells in the Old Bridge Formation because of high iron and chlorides concentration, and substitute a new well further inland, and a treatment plant. The high chlorides were part of the salt water intrusion of the aquifer, which was undoubtedly caused in part by Keyport's wells. The new well proving insufficient, Keyport was given permission to drill another well in 1982. When the permit was renewed in March 1984, it included a specific requirement that the permit was for a limited period, to December 1989, was not subject to automatic renewal, and that Keyport should study alternative sources of water, as well as programs of water conservation. The major past expenditures of Keyport was due to the fact that wells were unfortunately located. There is no doubt that Keyports' withdrawals contributed to the over-use of the aquifer and should be subject to reduction on the account. In fact, if hydro-geological considerations alone were taken into account, a case could be made that reduction of withdrawals adjacent to salt water intrusion should be higher than that of others. No rationale has been proposed which would justify omitting Keyport, other than the fact that including them in the critical area program will cost them more money. Unfortunately the same could be said for all other municipalities in the critical area.

Mr. Paul Burdan, Monmouth Consolidated Water Company, asked that consideration be given to use of surplus surface water form the company's reservoirs, on a conjunctive use basis.

RESPONSE

The procedures will allow for this to be done.

Kevin Toolan, T & M Associates, represents a utilities authority that had a well constructed in 1980 or 1981 under an approved permit and never placed in operation.

RESPONSE

In such cases a base allocation will be given, and the proposed procedures have been revised to provide for it.

May 14th Hearing

L. Mason (by letter), Mr. Neely of East Brunswick, objected to the proposed reduction in present allocations which he regards as "punishment". In effect, he recommends that prior to making any reductions in groundwater withdrawals, all municipalities in the critical area be required to follow out a water conservation program similar to that of East Brunswick, to include:

> full metering, active leak detection program, mandatory water restrictions, permits required to install new landscaping, increasing block rates for water, and provision of free retrofitting material.

RESPONSE

The Department favors full metering and an active water conservation program; but cannot rely on such a program alone to solve the problems of the critical area. East Brunswick claims to have reduced demand 15% by such measures, which is plausible. However, a reduction of 15% in demand throughout the critical area would not be sufficient to counter the depletion of aquifers, even initially, with demand growth still to be provided for.

Moreover, the legality and practicability of the State's mandating specific requirements of this nature throughout the various municipalities concerned is at least dubious. Many municipalities are reluctant to impose new permit requirements and mandatory water restrictions on their citizens, do not agree with increasing block rates for water, and prefer for citizens to pay for their own retrofitting devices. The procedures proposed for the critical area will provide a strong economic incentive to improve water conservation programs, while leaving it to the community to decide how far to rely on water conservation for meeting future water needs, and what form the conservation program to take. In addition, the statewide water conservation program, within the critical area as well as outside, will encourage both water conservation and metering by means of "unaccounted-for water" limitations and controls.

As regards to other questions asked, the negotiations between connected and unconnected users will be subject to approval by the Board of Public Utilities, in cases where they have jurisdiction, and with the approval and consent of the Department of Environmental Protection. These approvals will be the basis for determining the exchange payments.

Ann Kruger, for the New Jersey Water Resources Coalition, endorsed the concept of these proposed procedures and most of the specific provisions. However, she proposed additional procedures of public involvement to be implemented prior to notification of reductions by water users, which is now scheduled for November 1985.

1) Dissemination of reports and documentation to all on mailing list (1200).

2) Joint meeting of Manasquan and south River Advisory Committees.

3) Development of criteria for reductions in allocations.

4) Conduct rule making process for proposed criteria.

5) Use of (revised) criteria to calculate reductions.

Also she objected to the statement that purveyors should be required to provide a water supply dependable yield equal to the demands of their customers, although during the discussion it appeared that this criticism referred to the use of the word "demand" in a technical sense rather than to the substance of the requirement.

Lastly, she advocated that the Boundary of Critical Area No. 1 be moved further west to include all of the recharge area of the PRM aquifer at least as far south as West Windsor Township.

RESPONSE

The dissemination of copies of all reports and documentation to 1200 persons on the mailing list would be unduly expensive and is unwarranted.

The additional public involvement procedures recommended certainly warrant consideration. The two advisory groups referred to were consulted and were useful in the formulation of these procedures; and it is intended to continue to consult them periodically during the period of at least two years required to implement the procedures. Joint meetings of the two groups could be arranged if both groups so desire. However, it would not be practicable to delegate to such advisory groups authority to establish criteria. The various municipalities and the privately owned purveyors have responsibilities, as well as the State. The comment indicated that the draft procedures appear to be substantially acceptable to the coalition. The main points in the draft procedures were established by the regulations, which did go through the formal rule-making processes. The initiation of another formal rule-making process, following a complex public involvement arrangement, would delay the program by many months.

It is noted that in the two public involvement meetings and three public hearings that preceded this hearing, groups concerned did not voice any dissatisfaction with the process of establishing the procedures.

The statement in the draft procedures about requiring purveyors to establish a reliable need equal to the demands of the customers, will be reworded to correspond more closely to the regulations.

The proposed extension of the boundaries of the critical area west to include the recharge area has a clear rationale, since the recharge area is hydrologically connected to the rest of the aquifer. This suggestion was brought up, considered, and rejected in the establishment of the regulations, and cannot now be revised by the procedures. Even though it is possible in the future for excess withdrawal in the recharge area to adversely affect the aquifer, the critical area could be extended further at that time. Conditions in most of the recharge area itself are not now critical, within the meaning of "critical" established by the regulations.

It is of course true that protection of the recharge area against over building and pollution is vital to continued use of the aquifer. However, this type of protection would not be provided by extension of the critical area controls, which only deal with water withdrawals, but only by a new program of aquifer protection, which is being developed through a county demonstration project and is not yet fully defined.

Mr. Korzun, Lower Raritan-Middlesex County Water Resources Association, supports the proposed procedures and wants surface alternatives developed rapidly.

COMMENTS BY LETTER SUBSEQUENT TO THE HEARINGS:

Monmouth County Planning Board

Supports the proposed program, but recommends that water lines not be extended through unpopulated areas.

RESPONSE

This point was covered in a previous response.

New Jersey Builders' Association

Confirms points made at the hearing.

Sareford Nalitt Company

Opposes regulations to the extent they curtail or delay development, urges prompt development of alternative sources.

RESPONSE

If purveyors make their plans promptly, there is no reason why there should be serious delay in development. It should be clear that alternatives will be available. Any delay will be in determining the price.

T & M Associates

Elaborated on testimony at hearing.

RESPONSE

Indicated in previous response.

Mr. Charles Robinson, Ad Tek Engineering, on behalf of Perth Amboy Runyon Property, asks:

(a) that Old Bridge Aquifer of Runyon Water Supply be excluded from the critical area.

(b) allow higher yields during preceding 25 years to be used instead of the 1983 base year.

(c) increase records of pumpage by 0.78 mgd to allow for filter backwash.

(d) provide recognition of special circumstances.

(e) use aquifer storage capacity as a reservoir during drought.

(f) arrange a meeting to discuss these matters.

RESPONSE

The allowance for recharge to wellfields will have to be evaluated on a case-by-case basis. However, the history of the past 25 years cannot be given much weight, since it is the actual withdrawals of recent years which are depleting the aquifers. A meeting will be arranged.

Mr. N.R. Smolney, South Amboy, objects to procedures proposed, and proposes that they be withheld until after the water withdrawal reductions are issued.

RESPONSE

It has already been indicated that the Department is considering reductions in the 30-50% range. Until the procedures are definitely adopted, the extent of the withdrawals would still be subject to change. We cannot afford such delays.

South Amboy also requests the DEP to abandon the plan for cross-the-board reductions in favor of computer modeling to predict financial and technical impacts.

RESPONSE

This suggestion is meaningless without some concept of what the computer modeling would be based on.

South Amboy also requests:

(1) The reductions be made on the basis of existing diversion rights.

(2) The State be prohibited from issuing any new groundwater diversions in critical areas and that existing water diversions be permitted to be sold between purveyors to those systems desiring additional supplies. This would provide a measure of compensation to partially offset expenditures by existing permittees.

(3) Municipalities with prior major business losses, but with an historical record of diversions, be permitted to maintain said diversions in order to attach replacement industrial, commercial, and/or residential development to permit economic recovery.

(4) That "Class 1 purveyors" be exempt from said regulations due to their inherent fluctuations.

RESPONSE

(1) This would be unfair to users whose allocations are only slightly in excess of actual usage. It is actual usage and not allocations which has depleted the aquifer. Municipalities which have been successful in obtaining allocations far in excess of actual need should not be rewarded.

(2) The arbitrary stopping of all groundwater diversions in critical areas would be arbitrary and totally unjustified. To allow existing excessive allocations to be sold would

be contrary to provisions of existing water law in New Jersey, and, moreover, grossly inequitable.

(3) The critical areas program is not responsible for prior major business losses, and cannot be used as a means of recouping them.

(4) There is no rational basis to exempt any class of purveyors from the critical area restrictions. All users contribute to the depletion of the aquifers, and to the extent that they do so, it is equitable that they should contribute to the remedial program. To call such a program arbitrary and capricious does not make it so.

Mr. T.W. Birdsall, Township of Wall, (1) would like to modify the proposed use of the withdrawals of 1983 as the sole basis for a base allocation, since the township implemented a water conservation plan in 1983.

RESPONSE

Such a case can be equitably adjusted, if appropriate, under provisions of par. 11 of the proposed procedures.

(2) the township also feels that communities with usually rapid growth, should be given better treatment by calculating base allocations on the basis of projected populations up to at least 1990, rather than 1983.

RESPONSE

Similarly, towns with stable population feel that rapidly growing communities should bear more of the burden.

(3) the township also feels that credit should be given to communities that had active conservation programs and low per capita consumption in 1983.

RESPONSE

Such a case may be adjusted if appropriate under provisions of par. 11 of the proposed Regulations.

Mr. Gordon N. Litwin, for the Borough of Keyport, by letter supplemented testimony given by the Mayor of Keyport at the hearing. In addition to providing figures as to indebtedness an account of water supply investment, he specifically requests that Keyport be "grand fathered", by continuing the existing use of water without reduction.

RESPONSE

In substance, the points made are covered in the response made to the mayor's testimony at the hearing. There must be some basis or principle for sharing the costs of providing surface water to make up for depletion of aquifers. No more equitable basis has been found than to require all users to participate proportionately to their contribution to that depletion.

Mr. Eric Foster, of the Borough of Freehold requested that the current allocation of Freehold be maintained; because the borough is stable in population and has instituted a water conservation plan. These requests are similar to requests by other stable communities and by other communities with water conservation programs, and have been dealt with in previous responses. A more complete reply was sent direct.

GENERAL SUMMARY

It is apparent from the public hearings that there is a very broad basis of public support for the designation of this water supply critical area, and for the procedures proposed.

There was virtually no public opposition to the general concepts or to the boundaries and aquifers as specified.

Several municipalities and groups requested modifications in the proposed uniform ratio of reducing current aquifer withdrawals to obtain a (lower) base allocation for the future. (The reduction in withdrawals is for the purpose of reducing overdraft of the aquifers, and is to be accompanied by a purchase of other water). These proposals were designed to favor the interests of particular groups. Slow-growing towns requested that more of the burden be placed upon fast-growing communities, while fast-growing communities and builders wanted an easing of the burden upon themselves. Similarly, farming interests wanted special concessions to be made for agriculture. Two towns which have previously made large investments for water supply and incurred business losses want these factors to be applied so as to exempt them from the full impact of contributing to reduce overdraft of the aquifers.

A somewhat more plausible request is to consider circumstances of water conservation, leak detection, etc. among various purveyors. If a town has recently made economies of this nature, it may have reduced demand by 1983 so that year is no longer typical of recent year withdrawals. In such a case, under par. 11 of the proposed procedures, consideration of other recent years can be given. A somewhat different request is made by East Brunswick. That township urges that the specific water conservation measures undertaken by themselves be required of all other communities in the critical area, prior to imposing further restrictions on anyone. However, this is not practicable. Aside from the very dubious legality of mandating specific water conservation approaches by an unwilling municipality, the economies affected would not be sufficient for the purpose. Moreover, the majority of municipalities are unwilling to adopt some of the measures required by East Brunswick.

Besides conservation, several other points are raised regarding the selection of 1983 as a base year. This year was chosen because(a) it was the first year showing a large degree of recovery from drought conditions, and (b) it was the last year of record available at the time computations were undertaken. Some communities and farmers have special reasons other than drought why 1983 may not be a typical year. In such cases, where appropriate, special consideration can be given under provision of par. 11.

Questions were raised regarding special consideration to installations having artificial recharge facilities. It is agreed that this should be done, to the extent that recharge reduces net withdrawal from the aquifer.

A point has been raised verbally, by Monmouth County Planning Board that pipelines should not be passed through sparsely populated areas. Certainly avoidance of undesirably located development is an important consideration in planning; but the water supply critical area regulations do not include provisions to regulate the routing of pipelines. Therefore, the procedures should not extend to such matters.

A final major point was extension of the critical area boundaries to include recharge areas to the West. As indicated in the individual responses, this was not consistent with the basis regulation, and is impracticable at this time.

A revised draft of the proposed procedures is attached.

RECOMMENDATION:

That the Department approve attached maps and procedures and establish Water Supply Critical Area No. 1.

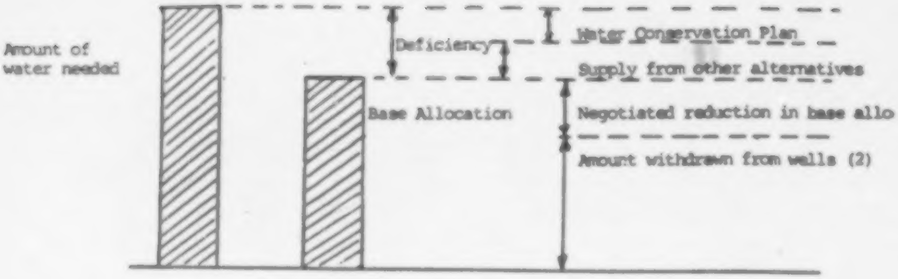
W. W. Whipple

WW:bs

Enclosure

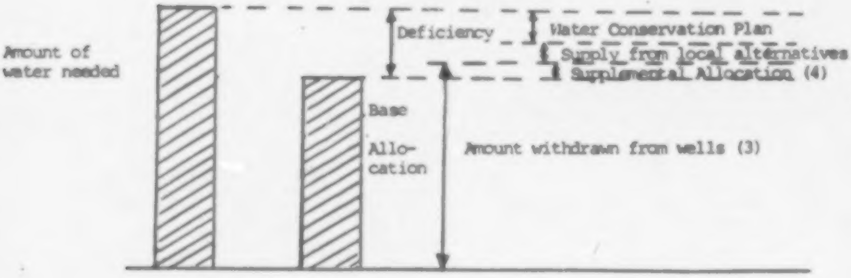
CASE I

Connected User


Amount of water needed
Deficiency
Water Conservation Plan
Supply from other alternatives
Base Allocation
Negotiated reduction in base allo
Amount withdrawn from wells (2)

CASE II

Unconnected User


Amount of water needed
Deficiency
Water Conservation Plan
Supply from local alternatives
Supplemental Allocation (4)
Base Allo- cation
Amount withdrawn from wells (3)

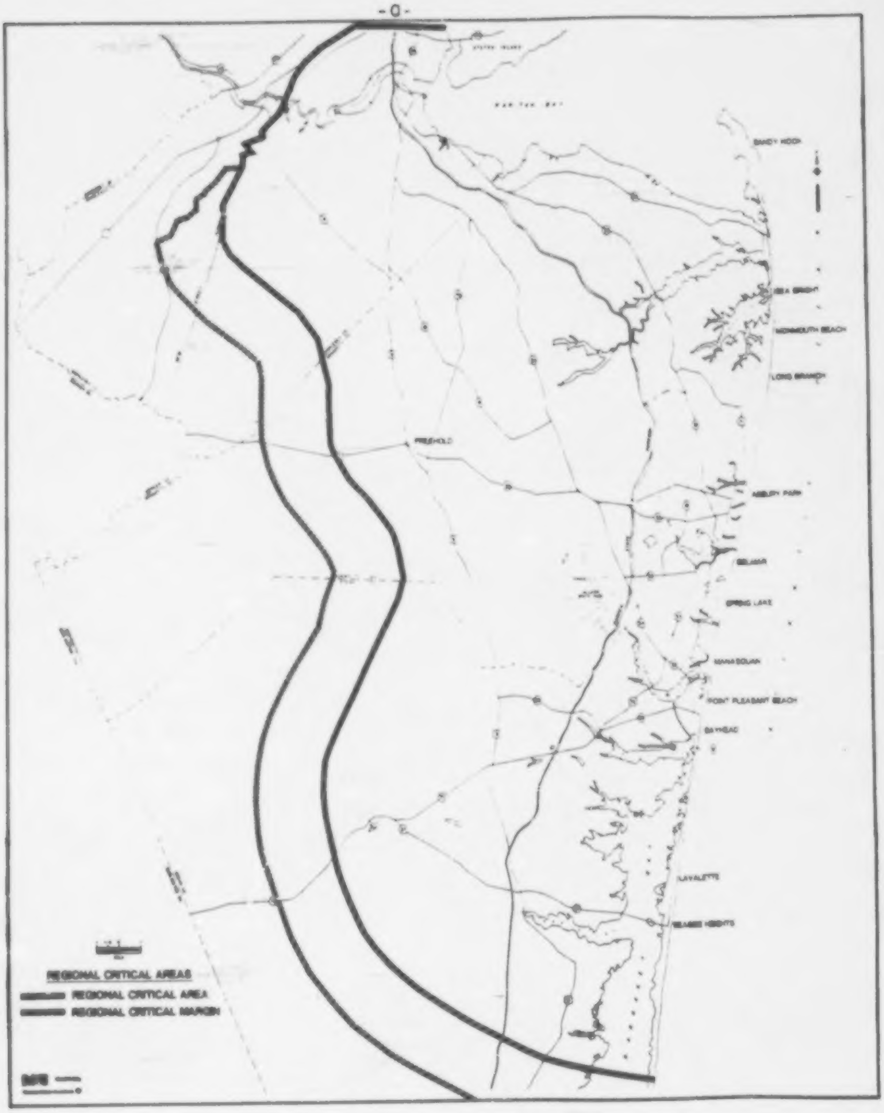
(1) Water which by negotiated arrangement is paid for by an unconnected user.

(2) Will be entire base allocation unless there has been a negotiated reductions.

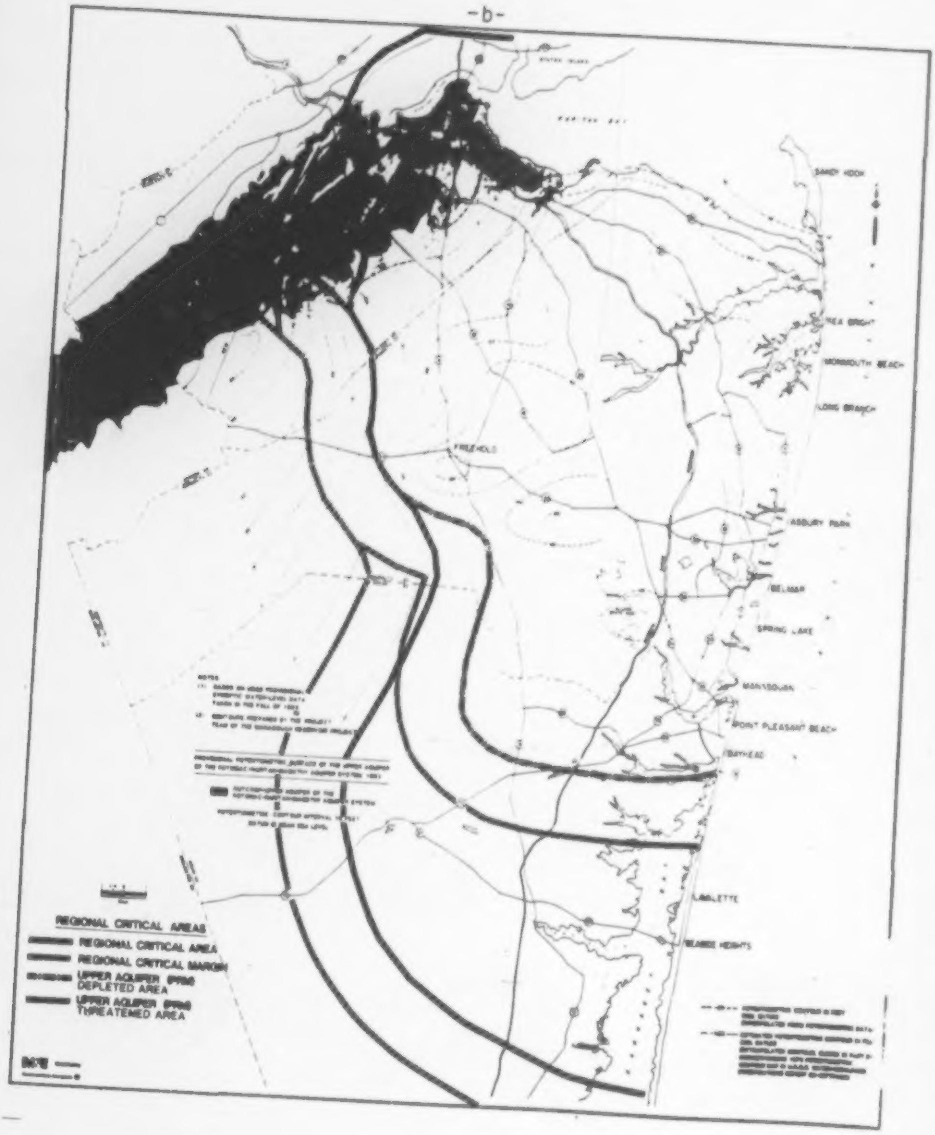
(3) Will be entire amount of water needed, unless water conservation plan or local alternative is provided.

(4) Obtained by negotiating a purchase of water from a connected user who agrees to relinquish a portion of his base allocation in exchange for payments to cover the cost of water purchased from an alternative source.

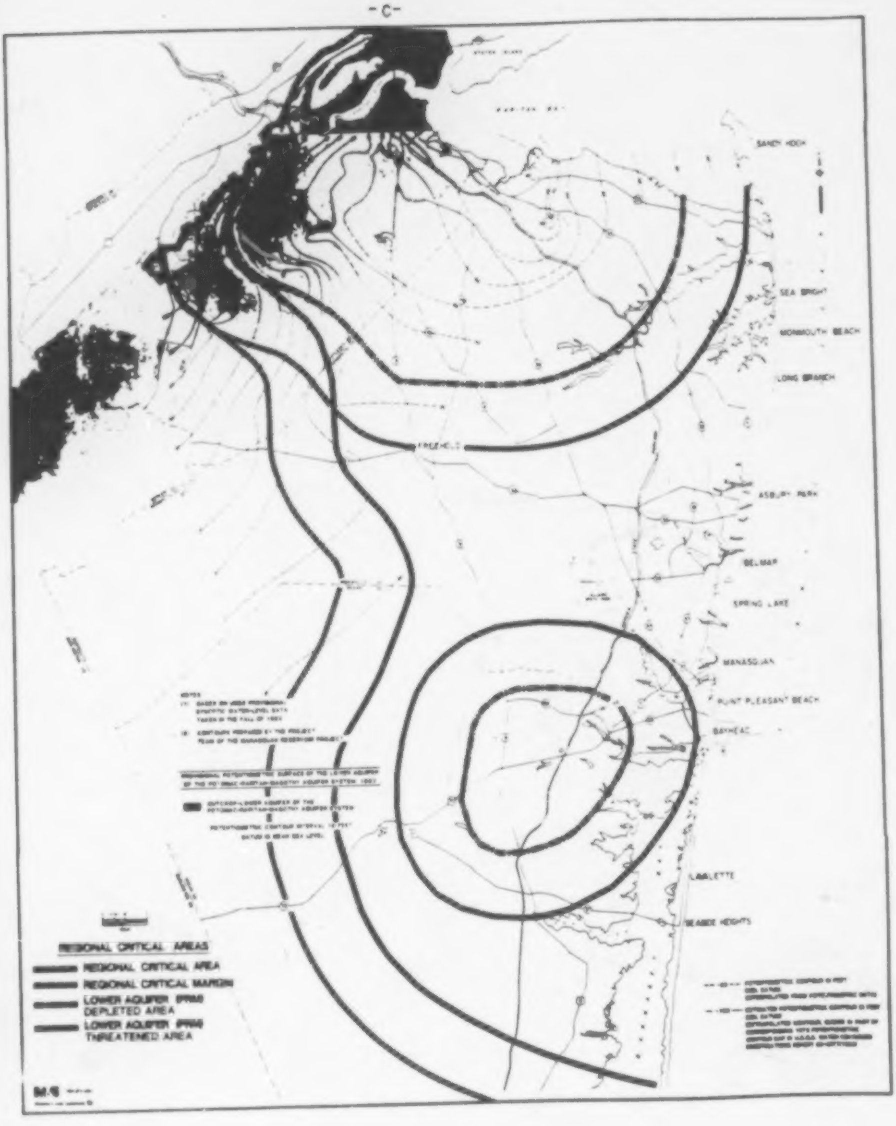
-0-


STATEN ISLAND
RARITAN BAY
SANDY HOOK
SEA BRIGHT
MONMOUTH BEACH
LONG BRANCH
FREEHOLD
ASBURY PARK
BELMAR
SPRING LAKE
MANASQUAN
POINT PLEASANT BEACH
BAYHEAD
LAVALLETTE
SEASIDE HEIGHTS
REGIONAL CRITICAL AREAS
REGIONAL CRITICAL AREA
REGIONAL CRITICAL MARGIN

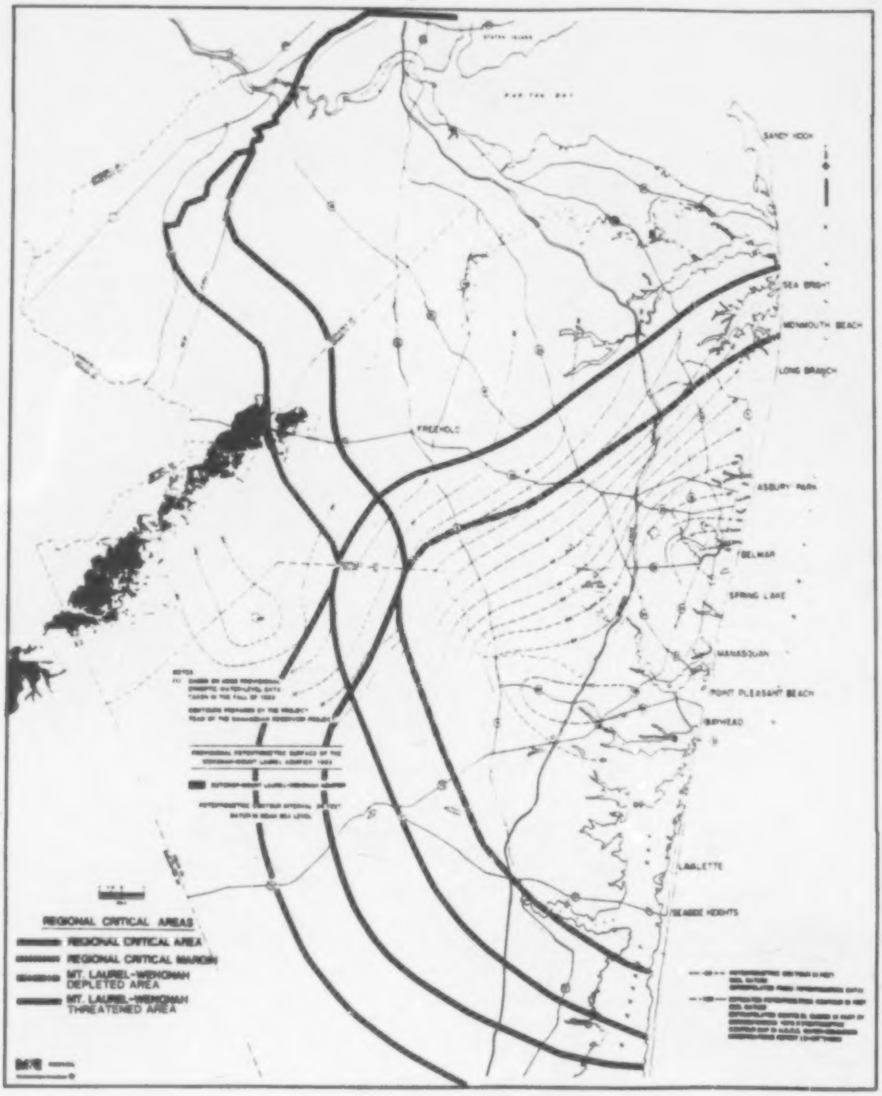
-b-


STATEN ISLAND
RARITAN BAY
SANDY HOOK
SEA BRIGHT
MONMOUTH BEACH
LONG BRANCH
FREEHOLD
ASBURY PARK
BELMAR
SPRING LAKE
MANASQUAN
POINT PLEASANT BEACH
BAY HEAD
LAVALLETTE
SEASIDE HEIGHTS
NOTES
REGIONAL CRITICAL AREAS
REGIONAL CRITICAL AREA
REGIONAL CRITICAL MARGIN
UPPER AQUIFER (PRM) DEPLETED AREA
UPPER AQUIFER (PRM) THREATENED AREA

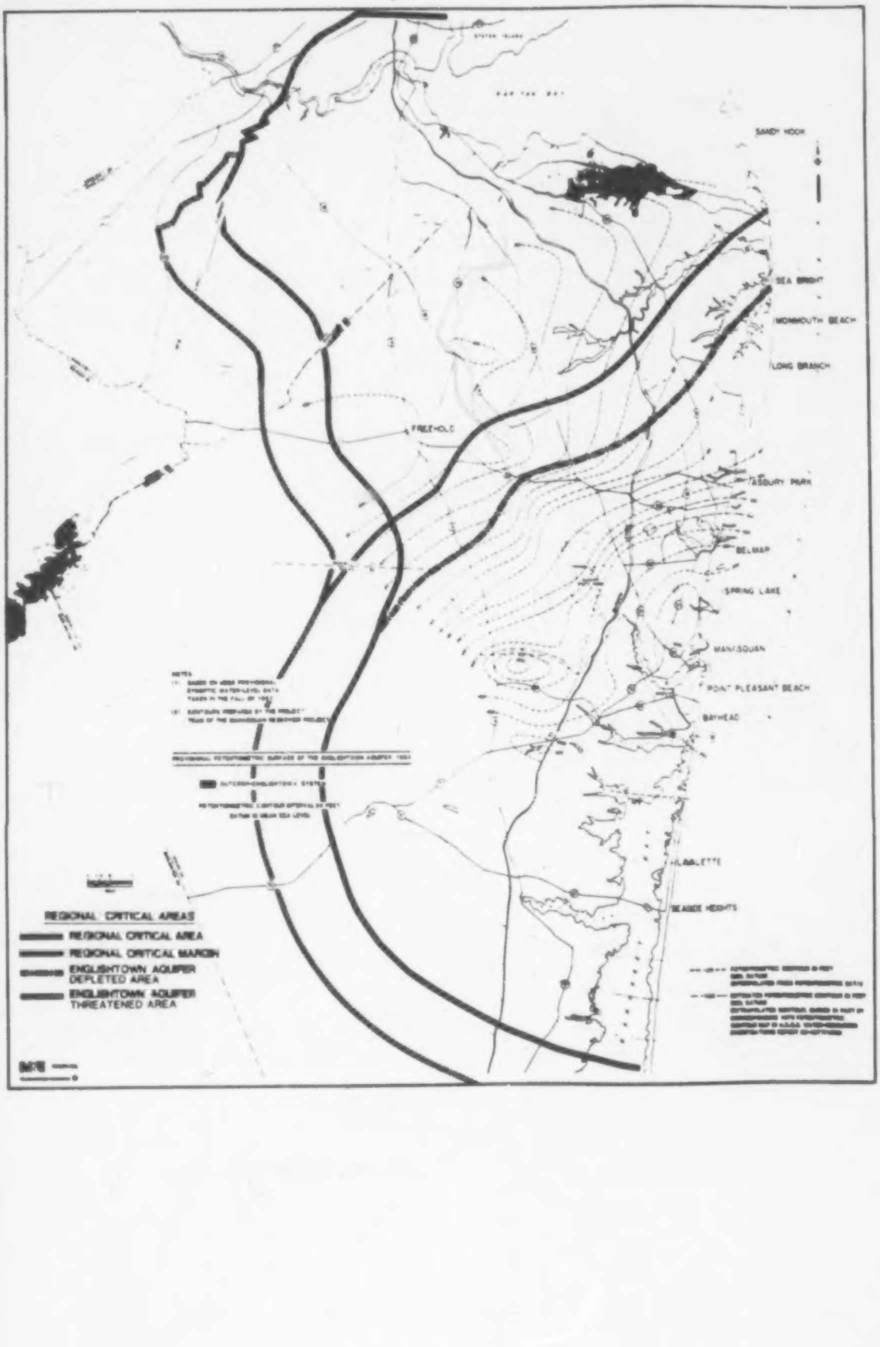
-C-


STATEN ISLAND
RARITAN BAY
SANDY HOOK
SEA BRIGHT
MONMOUTH BEACH
LONG BRANCH
FREEHOLD
ASBURY PARK
BELMAR
SPRING LAKE
MANASQUAN
POINT PLEASANT BEACH
BAYHEAD
LAVALLETTE
SEASIDE HEIGHTS
REGIONAL CRITICAL AREAS
REGIONAL CRITICAL AREA
REGIONAL CRITICAL MARGIN
LOWER AQUIFER (PRM) DEPLETED AREA
LOWER AQUIFER (PRM) THREATENED AREA
M-S

-d-


STATEN ISLAND
SANDY HOOK
SEA BRIGHT
MONMOUTH BEACH
LONG BRANCH
FREEHOLD
ASBURY PARK
BELMAR
SPRING LAKE
MANASQUAN
POINT PLEASANT BEACH
BAYHEAD
LAVALLETTE
SEASIDE HEIGHTS
REGIONAL CRITICAL AREAS
REGIONAL CRITICAL AREA
REGIONAL CRITICAL MARGIN
MT. LAUREL-WENONAH DEPLETED AREA
MT. LAUREL-WENONAH THREATENED AREA

-e-


STATEN ISLAND
RARITAN BAY
SANDY HOOK
SEA BRIGHT
MONMOUTH BEACH
LONG BRANCH
FREEHOLD
ASBURY PARK
BELMAR
SPRING LAKE
MANASQUAN
POINT PLEASANT BEACH
BAYHEAD
LAVALLETTE
SEASIDE HEIGHTS
NOTES
REGIONAL CRITICAL AREAS
REGIONAL CRITICAL AREA
REGIONAL CRITICAL MARGIN
ENGLISHTOWN AQUIFER DEPLETED AREA
ENGLISHTOWN AQUIFER THREATENED AREA

# PROCEDURES FOR IMPLEMENTATION
# OF WATER SUPPLY CRITICAL AREA NO. 1

These procedures apply to Water Supply Critical Area No. 1 established in portions of Monmouth, Middlesex and Ocean Counties under provisions of paragraph 7:19-6.10(a) and (b) and 7:19-6.13 of the regulations. The procedures themselves will implement provisions of paragraph 7:19-6.10(c) and (d).

1. General: Water Supply Critical Area No. 1 being established under provisions of the General Water Supply Management Regulations has been outlined on maps attached. The outside of each line governs. The following features are shown:

a. A general outline of the area. At every point in this area at least one aquifer is depleted or threatened.

b. Within the generally outlined area, lines on the map for each aquifer indicate which portions of the aquifer are considered threatened areas.

Within the entire outlined area, including the marginal areas, any new or increased withdrawal of over 10,000 gallons per day from any aquifer, including wells not fully operational by the effective date of these procedures, will require a water allocation permit or certification, as appropriate. Such allocations will only be permitted (or certified) with the same restrictions as for new allocations of over 100,000 gallons per day.

2. Notification to Water Users: Each water user will be notified that:

a. He is in a critical area, and his groundwater usage is from a depleted or threatened aquifer. If he is not within the critical area, such information should be presented in writing.

b. His recorded total water withdrawal from groundwater during 1983 will be specified. (If this does not correspond to his records he should contact the Bureau of Water Allocation within 30 days). Where there is no satisfactory record for 1983, 1984 records will be used. Also see paragraph 11 below for exceptions. All references to 1983 withdrawals in this document are interpreted in this manner.

c. If in a depleted area, the annual water withdrawal from the aquifer which is allowed as a base allocation will be reduced from 1983 annual withdrawal, effective as soon as alternative water supply becomes available. (Peak withdrawal rates allowed in the permit will not be affected).

For purposes of the General Management Regulations, the reduced base allocation will be the users share of the dependable yield of the aquifer; and it will be the dependable yield of his wells. After completion and approval of the hydrogeological study and modeling of the threatened aquifers, he will be notified exactly what his reduced base allocation will be. This will probably occur in November, 1985.

Under provisions of the General Management Regulations, public water supplies will be required to have a water supply dependable yield equal to the normal demand of customers. Within 14 months after the official notification of his base allocation, each public water supplier must have a specific plan to obtain an amount of water equal to the difference between his required dependable yield and base allocation, including provisions for anticipated growth.

d. If in the marginal area, the base allocation of each user will be the 1983 withdrawal. The user will not be allowed to exceed the 1983 annual withdrawal in the future without providing an additional amount through the alternatives of paragraph e. below.

e. Each user must have a plan based on one or more of the three alternative courses of action. The alternative courses of action are:

   1. An approved plan for water conservation (to be implemented during 1987).

   2. Purchase of Manasquan Reservoir Project water.

   3. Other approved alternative projects, either to produce more water, or to purchase additional water, in either case from sources other than a depleted or threatened aquifer.

Within the Manasquan Service Area, if the user cannot obtain approval by the Department of his plans to provide enough water through a combination of (1) and (3) above, he will be required to obtain the balance through the purchase of Manasquan project water, to become effective as soon as that project becomes operational.

If his approved alternative is production or purchase of additional water from other alternative sources, he will be required to implement the arrangement as soon as the alternative becomes operational, or can be feasibly constructed, but in any case not later than 1990.

3. Unconnected Users:

Unconnected users are those water users who cannot physically receive alternative project water, either directly or under a pass-through agreement. However, each of them can contribute his equitable share to protection of the aquifer by purchasing from a connected purveyor the required quantity of water, which a connected purveyor will use to replace part of his base allocation. This arrangement will ensure that this additional quantity of water will remain in the aquifer, while the money purchase will constitute the equitable contribution required by the regulations. Upon such an arrangement being confirmed, a supplemental allocation will be made to the unconnected user by the Department, allowing him to withdraw additional water from the aquifer over and above the base allocation.

In such an arrangement, the connected user will give up a part of his base allocation of groundwater, receiving in exchange alternative project water for which some unconnected user has paid. (See figure attached) In order to facilitate such arrangements, the Department will arrange with connected users in advance for a reduction of withdrawals below the connected users base allocation. Preference will be given t o connected users in the most severely depleted aquifers and near the sea coast. In the event that, for some reason, the arrangement between connected and unconnected users lapses, the full base allocation will be restored to the connected user. Connected users may be required as a condition of their permits to accept up to 20% of their base allocation in surface water to be paid for by others, and a higher proportion may be negotiated.

The above arrangement is different from connections for pass-through services, where a charge may be imposed.

In accordance with regulations, terms of such arrangements will be subject to approval by the Department, and where appropriate by the Board of Public Utilities.

4. Timing:

The mandatory reduction in groundwater withdrawals will not occur until the alternative source becomes operational. In the case of Manasquan Reservoir users, this will be 1990 when the when the Manasquan projects comes on line. However, by January 1, 1987 all users, both connected and unconnected, will be required to make firm and formal commitments in advance. As soon as proposals for water conservation plans and possible alternative sources are reviewed and verified, either the user must sign a contract with the New Jersey Water Supply Authority or another approved alternative source of water.

As plans submitted by connected and unaccounted users are received and approved by the Division, modified water allocation permits will be issued confirming the timetable and management arrangements. Permit conditions incorporating the management arrangements will be enforceable under the regulations. Arrangements for agricultural users will be announced later.

5. Interim Withdrawals:

For the period prior to the Manasquan project or other alternatives becoming operational, temporarily increased allocations from threatened aquifers may be made to meet interim needs. These temporary allocations will not convey any rights to increased base allocations. After the alternative source of water becomes available, users must use such wells within the terms of their base allocation and approved plans for alternative sources.

In all parts of the critical area, no interim withdrawals will be approved if an available alternative exists, or if the user has failed to develop and implement reasonable conservation or rehabilitation plans.

6. Service Area Limitations:

In general, it is intended that Manasquan Reservoir project water be reserved for the present and future needs of the service area. Water shall be distributed outside the area with approval of the Department.

7. Policy:

The development of individual (residential) wells and other small wells within the critical area can be limited by local and county authorities. The use by developers of many individual wells as a means of avoiding critical area controls will be overruled by the State when development plans for water (and sewer) are submitted to the State for approval. Such State approval is provided for by law. (Although such authority has not been exercised in the past in deference to local and county planning boards). The drilling of large numbers of additional small wells would be detrimental to the regional water management system. The probable interference by numerous small wells would not be in the public interest and might result in increased restrictions on other users.

those typical of recent years, the withdrawals of a selected prior year may be accepted as a basis rather than the year 1983 (or 1984). Where a withdrawal permit has been issued, but no usage occurred, in 1983, a typical usage will be assumed by the Department through the same process as for the initial establishment of the critical area, as stated in the regulations.

12. Adjustments of Critical Area Boundary and Procedures:

Periodically, the Department will review the groundwater situation within the critical area, and also in adjacent areas, including recharge areas, to determine whether changes in groundwater pressure levels, salt water intrusion or other aspects indicate that a change in boundaries or in base allocations, or in procedures would be desirable. If a change is found to be desirable this will be initiated and adopted through the same process as far as the initial establishment of the critical area, as stated in the regulations.

13. Avoiding Violations:

Violations of these procedures including restrictions as to total annual withdrawal will be subject to penalties, as set forth in regulations 7:19-6.15. However, a violation may be avoided by requesting in advance a supplemental withdrawal allocation. For connected users, the excess demand should be met by additional purchases from the connected sources; but if this source cannot meet the demand, a supplemental allocation may be given to the connected user, as for unconnected users. Supplemental allocations will not be given after the fact.

8. Recharge:

In cases where artificial recharge can be used to replenish depleted aquifers, and an accurate measurement can be made of the amount recharged, the Department, upon verification of the facts and approval of the installation, will add to the base allocation an appropriate amount. This amount will be based upon the verified replenishment of water to the aquifer by the recharge facility, making allowance for infiltrated water which may be lost by evapo-transpiration or percolation into surface streams. It will be the responsibility of the user to demonstrate to the satisfaction of the Department that the replenishment actually occurs. This verified replenishment will be subtracted from the withdrawal from the aquifer by wells to obtain the net usage, which will be subject to reduction to arrive at the base allocation by the same factor as for well usage not involving recharge.

In considering recharge, for installations already in existence or approved prior to the effective date of these procedures, no credit will be given for net replenishment in excess of withdrawals. The base allocation can be equal to the withdrawal of the base year but not in excess of it.

No consideration will be given to recharge occurring as a result of open space, or other arrangements which cannot be computed and recorded accurately.

9. Conjunctive Use:

The Department will encourage conjunctive use arrangements to reduce the demand upon depleted and threatened aquifers, under either temporary or permanent arrangements. When surface water is available during high-flow months, arrangements for connected users to purchase this surface water will be considered a preferred alternative, rather than withdrawing water in excess of basis allocations from threatened aquifers.

10. Allocation Process:

The Department's general approval will be expressed in modified water allocation permit or certification, which will specify the base allocation, any supplemental allocations, limits of peak withdrawals and if applicable, arrangements to accept water paid for by others to replace a part of the base allocation.

11. Special Cases:

In the case of agricultural and other users, who can demonstrate that the withdrawals of the year 1983 (or 1984) were less than

# WATER SUPPLY MANAGEMENT ACT RULES

N.J.A.C. 7:19-6 et seq

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
MARCH, 1985

## WATER SUPPLY MANAGEMENT ACT RULES

### 7:19-6.1 Scope and Authority

(a) The Statewide Water Supply Master Plan represents the planning mechanism by which the State approaches its water needs. Inclusion of a project in the Master Plan is a prerequisite for the expenditure of funds under the Water Supply Bond Act of 1981.

(b) This subchapter is intended to provide administrative mechanisms through which some of the objectives of the Water Supply Management Act and more specific goals of the Water Supply Master Plan may be accomplished.

(c) The specific provisions mandated by this subchapter are subject to modification by administrative order by the Department. The provisions of this subchapter shall not supercede the provisions of administrative orders issued by the Department prior to the effective date of this subchapter.

(d) This subchapter includes administrative procedures and policies to carry out specified management responsibilities of the Department. These requirements supplement other rules adopted by the Department, such as the water allocation procedures for agricultural and non-agricultural uses of water (see N.J.A.C 7:19-1 et seq.).

(e) To avoid the imposition of needless administrative burdens on water purveyors and users, only a limited number of specified requirements in this subchapter apply throughout New Jersey. Other requirements are only applicable within designated water supply critical areas, where special situations require a greater degree of control to be exercised by the Department.

### 7:13-6.2 Definitions

The following words and terms shall have the following meanings unless the context indicates otherwise:

"Act" means the Water Supply Management Act, N.J.S.A. 58:1A-1 et seq., P.L. 1981, C.262.

"Adverse impact upon wells" means a forced reduction in pumping rate or a required change in the construction of an affected well or any impairment of water quality.

"Aquifer" means any water-saturated zone in sedimentary or rock stratum which is significantly permeable so that it may yield sufficient quantities of water from wells or springs in order to serve as a practical source of water supply.

"Allocation permit" means the document issued by the Department to a person, granting that person the privilege, so long as the person complies with the conditions of the permit, to divert water for any purpose other than agricultural or horticultural use.

"Class A standard" means the capacity of one or more interconnections with an adjacent water systems having the combined capacity to supply 75 percent of the average water usage of the receiving system, while relying on no more than one adjacent system for more than 25 percent of the average water supply of that adjacent system.

"Class B standard" means the capacity of one or more interconnections with an adjacent water system, having the combined capacity to supply 50 percent of the average water usage of the receiving system, while relying on one adjacent system for no more than 35 percent of the average water supply of that adjacent system.

"Class 1 purveyor" means a water purveyor which serves a population of up to 10,000 persons.

"Class 2 purveyor" means a water purveyor which serves a population of 10,001 to 50,000 persons.

"Class 3 purveyor" means a water purveyor which serves a population of over 50,000 persons.

"Confined aquifer" means an aquifer which contains groundwater confined under pressure between relatively impermeable or significantly less permeable material so that its groundwater surface rises above the top of the aquifer

"Critical water supply area" or "critical area" means a water supply area in which it is officially determined by the Department, after public notice and a public meeting, that adverse conditions exist, related to the ground or surface water, which require special measures in order to achieve the objectives of the Act.

"Dependable yield of subsurface sources" means that yield of water from a subsurface source or sources available continuously during projected future conditions, including a repetition of the most severe drought of record, without creating undesirable effects. Undesirable effects may include adverse impact upon other wells of a depth of 50 feet or more, increased risk of introducing or spreading saline water or polluted water in the aquifer or unacceptable reduction of surface flow of streams.

"Dependable yield of combined surface/ground water sources" means the yield of water by a water system which is available continuously throughout a repetition of the most severe drought of record, without causing undesirable effects, as described in the definition of "Dependable yield of subsurface sources" above.

"Drought" means a condition of dryness due to lower than normal precipitation, resulting in reduced stream flows, reduced soil moisture and/or lowering of the potentiometric surface in wells.

"Interconnection" means a water supply connection with another water supply system or systems.

"Multiple sources" means one or more production wells, surface water intakes, or interconnections or a combination of wells, surface water intakes or interconnections utilized to meet the demands of a public community water system.

"Normal demand" means the annual average demand during the three preceding non-drought years, including normally occurring peaks.

"Purveyor" means any person who owns or operates a public community water system.

"Public community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

"Safe yield from surface sources" means the yield maintainable by a water system continuously throughout a repetition of the most severe drought of record, after compliance with requirements for maintaining minimum passing flows.

"Single prime source" means a single diversion of surface or groundwater, including an interconnection, capable of providing the peak water demand of a public community water supply system.

"Unaccounted-for water" means water withdrawn by a purveyor from a source and not accounted for as being delivered to customers in measured amounts.

"Unconfined or semi-confined aquifer" means an aquifer close to the land surface with continuous layers of materials with permeabilities in the high to low range, extending from the land surface to the base of the aquifer.

"User" means any person or other entity which utilizes water.

"Water allocation" or "certification" means the authority to withdraw surface or groundwater for use, pursuant to a permit issued under N.J.A.C. 7:19-1 et seq. or 7:20A-1.1 et seq.

"Water supply system" means a facility for providing potable water.

"Water table" means the water surface in the uppermost part of the water-saturated zone which is at atmospheric pressure.

"Water table aquifer" means a geological formation which carries water at atmospheric pressure at the top of the saturated zone.

"Yield of a water resource system" means the output of water from a system, available with monthly variations corresponding to the needs of the system.

7:19-6.3 Determination of safe or dependable yield

(a) Class 2 and 3 purveyors, within the first year after the effective date of this subchapter, and other purveyors within one year after written request by the Department, shall either accept an estimate of safe yield from surface supplies or of dependable yield of subsurface sources previously made by the Department or submit its own evaluation and estimate for the approval of the Department.

(b) A purveyor is required to provide a safe or dependable yield of water from its own sources, which, when added to water supplies available by contract and after subtraction of water obliged to be delivered by the purveyor by contract, shall be sufficient to provide for the normal demand of its own customers.

1. A progressive reduction in the potentiometric surface of an aquifer will be considered presumptive evidence that dependable yield of a subsurface source is less than current withdrawals, subject to acceptable evidence to the contrary.

2. Water supplies available by contract may be relied upon only if the contract is not subject to cancellation or suspension and assures the availability of water throughout a period of drought and if the source of supply is reliable. Water obtainable through interconnections shall not be included unless reliable delivery is assured by contract.

3. All contracts relied upon to meet the requirement of this subsection (b) shall be subject to review and approval by the Department to determine their compliance with the rules in this Chapter and the Act.

4. Increased safe yield or dependable yield of individual water supply systems may be allowed, to take advantage of system diversity and interconnections, but only in conformance with regional arrangements approved by the Department, under which coordinated systems of operation will assure system-safe yields greater than that which could be provided by the individual water systems.

(c) If a determination of yield in accordance with (a) above shows that a purveyor has insufficient capacity to meet the normal demands of its customers, the purveyor may elect to announce its decision to attempt to revise existing contract arrangements by a given date, as necessary, in order to serve the balance of its customers reliably during a drought. In such a case, the purveyor serving the balance of the customers will be required by the Department to immediately obtain a firm yield from some other source.

(d) As an alternative to (c) above, the Department may order a ban on further extensions of service to new customers or expansions of service to existing customers, or the Department may order the acquisition of additional water supply capability, or both. The Department must allow reasonable time for acquisition of additional water supply.

7:19-6.4 Unaccounted-for water

(a) For each of the water purveyor size classes (see N.J.A.C. 7:19-6.2, Definitions), an annual enumeration will be made by the Department of all purveyors, serving a population of over 500 persons, with unaccounted-for water in excess of 15 percent. The Department may, at a later date, increase this percentage, if experience indicates that the 15 per cent figure is low.

(b) For each purveyor size class (see 7:19-6.2, Definitions), the Department shall determine the percentage of purveyors having the highest proportion of unaccounted-for water, and these purveyors will be determined by the Department to be provisionally delinquent. This determination may not include more than 35 per cent of the total number of purveyors each year. These purveyors will be notified of their provisionally delinquent status.

(c) Purveyors found provisionally delinquent will be allowed one year in which to take appropriate corrective action, including elimination of leaks, establishment of records of use of previously unaccounted-for water and submission of a schedule for further corrective action. After consideration of supplementary information and the schedule submitted by the purveyor, an annual review of each provisionally delinquent purveyor will be conducted by the Department.

1. If the review establishes that the percentage of unaccounted- for water has been reduced to the median percentage for purveyors of that class, the provisionally delinquent status of the purveyor will be terminated.

2. If the provisionally delinquent status is reaffirmed and unless the purveyor submits a schedule for corrective action which is approved by the Department, an order will be issued by the Department, requiring the elimination of all undue losses in the system in accordance with a specified compliance schedule.

3. If the purveyor does not accept the findings of the annual review, it may request that the Department hold an informal, public fact-finding meeting, the findings of which must be approved by the Department.

4. Purveyors whose systems draw from and are laid in water table aquifers may be exempted from the requirements of this section 6.4, provided that circumstances are such that leakage losses will not contribute to water shortages and that this is adequately documented by the purveyor.

5. The fee for conducting this delinquent status review will be $300.00 for Class 1 and $1,000 for classes 2 and 3. After two years from the effective date of this subchapter, if it is determined that the average cost of conducting such reviews had decreased, the fees will be adjusted downward accordingly.

7:19-6.5 Water conservation

(a) Unless more stringent water conservation measures are required by the Department, all public community water systems shall:

1. Proceed expeditiously to correct leakage in the total distribution system, as detected through a systematic program to monitor leakage. Program results may be required to be submitted to the Department at least once every three years;

2. Adopt and implement, to the satisfaction of the Department, an on-going program to encourage water conservation for all types of use within the area served by the system. This does not preclude other water conservation requirements imposed by the Board of Public Utilities;.

3. Submit a water conservation report to the Department on or before the first anniversary of the date on which an allocation permit is granted, or other date specified in the permit. In areas subject to the supervision of the Delaware River Basin Commission, conservation reports shall also be submitted in compliance with Commission requirements. This report must describe the actions taken pursuant to the conservation program and the associated results;

4. File water rate structures which provide incentives for water conservation; with the Department and the Board of Public Utilities, as appropriate; and

5. Require installation of water meters for all new service connections; and critical areas, require installation of water meters for all existing service connections. This shall not apply to fire emergency uses. Small water systems with fewer than 500 service connections may be exempted from metering if it is shown that the annual average daily water use by the system does not exceed 350 gallons per day per service connection.

(b) Water systems with less than 500 service connections are not required to comply with the water conservation requirements of (a) 1-4 above until specifically notified by the Department

7:19-6.6 Rehabilitation

(a) Purveyors shall comply with the following requirements for preparation and implementation of management and status surveys:

1. Within one year after the effective date of this subchapter all Class 3 purveyors must perform management and status surveys in accordance with criteria to be provided by the Department, except that those having had such surveys or partial surveys performed within the preceding five years may, with the approval of the Department, submit such completed work in partial or complete compliance with this requirement. The survey must include an analysis of the current status of the system infrastructure and the planned

renewal and rehabilitation required to maintain the system in good physical condition, including preventative maintenance. The survey shall be accompanied by an evaluation of the status of the system, including acceptance or rejection of each recommendation and a schedule for planned renewal and rehabilitation. Within two years of the effective date of this subchapter all Class 2 purveyors must also submit such surveys and evaluations. The management and status survey require hereby does not preclude compliance with similar requirements of the Board of Public Utilities.

2. Upon approval by the Department, the schedule of planned renewal and rehabilitation shall commence upon the next fiscal year starting after approval by the Department; thereafter it shall be implemented annually by the purveyor.

3. If no management and status survey is submitted pursuant to the above requirements or if the recommended schedule is disapproved by the Department, planned renewal and rehabilitation of system infrastructure shall be carried out by each purveyor to the extent of 10 percent of total gross water supply revenue, in accordance with Departmental criteria.

4. Upon the effective date of these regulations, all Class 2 and 3 purveyors must initiate administrative preparation for planned renewal and rehabilitation programs, of the magnitude contemplated by this section, as applied to each purveyor's particular situation. This shall be done without awaiting the completion of the management and status surveys required above.

(b) Upon determination by the Department that any component(s) of a water supply system have deteriorated to a degree that may jeopardize the ability of the system to deliver an adequate and reliable supply of water or may cause waste of an unduly large amount of water, the purveyor shall submit, within a time period required by the Department, a report and implementation schedule specifically identifying the scope of rehabilitation work necessary, the time required for work implementation and the required water rate modification to finance the work.

(c) Upon approval of the report by the Department, the purveyor shall commence rehabilitation work in an expeditious manner and shall perform the work in a manner which minimizes system disruptions.

(d) All rehabilitation work performed on water supply systems shall conform to the current design requirements specified in the New Jersey Safe Drinking Water Act, N.J.S.A. 58:12A et seq., and this subchapter.

(e) For planned or required transmission/distribution system rehabilitation, loans will be provided on a priority basis, pursuant to the Water Supply Bond Act of 1981, (Public Law 1981, Chapter 261) and associated rules (N.J.A.C. 7:1A-1 et seq.), to the extent that eligibility requirements of the regulations are met and the funding availability allows.

1. In cases where a critical water supply transmission/distribution disruption exists, pursuant to N.J.A.C. 7:1A-1 et seq., application may be made for an emergency, interim rehabilitation loan. Upon approval of said

loan, the emergency applicant is required to make full application for a Water Supply Rehabilitation Loan, pursuant N.J.A.C. 7:1A-1 et seq.

### 7:19-6.7 System pressure and storage

(a) Public community water systems shall be adequately maintained so as to sustain minimum water pressures of at least 20 pounds per square inch at street level, in all parts of the distribution network, under all required flow conditions. The balances and interrelationships of source location, interconnections, transmission and distribution grid, size of transmission-distribution system lines, location of booster pumps, existence of pressure zones and location of storage facilities must be such as to insure the minimum pressure of 20 pounds per square inch at street level.

(b) With respect to the total capacity of system storage, the following minimum requirements apply to all systems. The Department may modify these requirements provided adequate justifying data is submitted which will demonstrate that service will not be disrupted during extended periods of system stress.

| Type of System | Minimum Storage Percentage of Average Daily Demand |
|---|---|
| i. Single, prime source, no interconnection(s), no auxiliary power at water source. | 100 percent |
| ii. Single, prime source, no interconnection(s), auxiliary power provided at water source* | 80 percent |
| iii. Single, prime source with interconnection(s)** | 50 percent |
| iv. Multiple source, no interconnection(s), no auxiliary power at water source | 80 percent |
| v. Multiple sources, no interconnection(s), auxiliary power provided at water source* | 50 percent |
| vi. Multiple sources, with interconnection(s) | 50 percent |
| vii. Multiple sources, interconnection(s), auxiliary power provided at water source* | 30 percent |
| viii Same as vii.above, and distributing more than an average of 50 million gallons per day | 20 percent |

---

*Auxiliary power must be able to supply at least 50 per cent of average production.

**Combined interconnection(s) must be able to supply at least 50 per cent of average production; contract commitment from supplier is required.

(c) Where system size allows, storage should be spread out and located at different points within the system.

(d) The provisions of this section, are intended to complement section 7:10-11.8(a) of the New Jersey Safe Drinking Water Act Regulations and are to be complied with in lieu of the present requirements in 7:10-11.8(a)3 and 4.

7:19-6.8 Interconnections

(a) In order to assure the availability of water during times of emergency, including drought, the Department may require interconnections of the Class A or Class B standard (see N.J.A.C 7:6.2, definitions) to the extent practicable and economically feasible for all Class 2 and 3 purveyors. The purveyor, upon being notified of such a requirement, is required to conduct an interconnection feasibility study which must identify the most cost-effective alternative and schedule for project completion. The conclusions of the study shall be approved by the Department before project implementation. Prior to issuing an order requiring interconnections, the Department shall advise the purveyor(s) of the proposed action and thereafter allow 30 days for submission of information by the purveyor(s). If undue hardship would be caused by the proposed action, it may be waived by the Department.

(b) For the purposes of this subchapter, potential interconnections shall be presumed to be economically feasible in all cases in which the actual service areas of two-purveyor systems are closer than 1000 feet, at the closest point, measured between mains at least eight inches in diameter. Exceptions to this requirement may be granted where hardship can be shown, such as where system pressures require a pumping station. In cases where there is a minimum distance of over 1000 feet, but less than a mile between adjacent service areas, a feasibility study may be required. Where adjacent service areas are more than a mile distant at all points, a feasibility study will be required only in cases where there are special conditions threatening the continued viability of the existing source of water.

(c) Unless it can be clearly shown that benefits accrue mainly to one system, costs of interconnections shall be shared between the participating systems. Where both systems benefit, distribution of costs between participating systems shall be proportionate to the benefits, as approved by the Department.

(d) Large, integrated water systems may be exempt from the requirements this section provisions, where it can be demonstrated that system components provide adequate alternative sources.

(e) If found to be necessary, to accomplish the purposes of the Act, the Department may order the constructions of interconnections by purveyors serving less than 10,000 population.

7:19-6.9 Operation of interconnections

(a) All Class 3 purveyors shall make a report as to the status of interconnections within one year of the effective date of this subchapter.

(b) All Class 2 purveyors shall make a report as to status of interconnections within three years of the effective date of this subchapter.

(c) If found to be necessary to accomplish the purposes of the Act, purveyors serving less than 10,000 population may be required to provide a report as to the status of interconnections.

(d) Class 2 and 3 purveyors shall make interconnection flow tests (without measurement) on an annual basis on all interconnections six inches or more in diameter, unless exempted by the Department. The results of such tests may be submitted to the Department at any time, but shall be submitted by the end of each calendar year.

1. Such annual tests shall be attended by representatives of both interconnected systems.

2. When specifically ordered to do so by the Department, a purveyor shall perform complete interconnection flow tests.

(e) All purveyors operating interconnections between public community water systems shall have rate tariffs for sale of water through such interconnections, which shall be part of the overall tariff for that system. The purveyor shall submit the tariff, once established, to the Board of Public Utilities, if appropriate, and to the Department.

(f) Higher rates may be charged during an emergency (see the Emergency Water Supply Allocation Plan Regulations, N.J.A.C. 7:19A-8.2).

(g) There shall be a written agreement between interconnected systems, specifying the conditions for use of each interconnection of six inches or more in diameter. The agreement must be approved by the Department and a copy placed on file with the Department.

7:19-6.10 Water supply critical areas, general

(a) Water supply critical areas are those areas in which it is officially determined by the Department, after public notice and a public meeting, that adverse conditions exist, related to the ground or surface water, which require special measures in order to achieve the objectives of the Act. The adverse conditions may include one or more of the following:

1. Shortage of surface water by the diversions from surface or groundwater sources which leave insufficient surface water for authorized users or for environmental protection purposes in an area at least ten square miles in extent.

2. Shortage of ground water by overdraft affecting at least ten square miles of an aquifer, beyond its long-term, dependable yield. This may be demonstrated by a verified mathematical groundwater model. In the event that such model is unavailable, it may be demonstrated by one or more the following:

i. A progressive lowering of ground water to the extent that existing wells of 50 feet or more in depth are threatened or rendered inoperative;

ii. A reduction of the annual, average potentiometric surface in confined aquifers to at least 30 feet below mean sea level (MSL), a portion of which area is within five miles of salt water or which contains the 250 parts per million or more of chloride isochlor;

iii. A reduction of the annual average potentiometric (pressure) surface in an unconfined or semi-confined aquifer to mean sea level or lower, a portion of which area is either within five miles of salt water or contains the 250 parts per million chloride isochlor;

3. Aquifer pollution, where actual pollution contaminates a substantial part of the aquifer or where major source(s) of hazardous or toxic pollution may be reasonably anticipated to contaminate the aquifer;

4. Location within the Delaware River Basin Commission planning area, where, by interstate agreement, certain reporting, well-drilling, allocation or other requirements apply which are not required elsewhere in New Jersey.

(b) For water supply critical areas described in (a) 1, 2 and 3 above, the delineation shall include all areas adversely affected and areas which may be adversely affected if present trends continue, such as where a progressive reduction of the potentiometric surface threatens existing wells or an aquifer with saline contamination. It may also include adjacent areas, where the slope of the potentiometric surface indicates a major source of water for the overdrawn area.

(c) Within water supply critical areas of the type described in (a) 1 and 2 above, where it is necessary to balance competing needs, the Department may reduce the privilege given to users to withdraw water, as previously allocated or authorized, and require those users to substitute water from a reasonably available alternative source. To the extent practicable, all users shall equitably share the burden of reductions and/or costs of replacement supplies. Procedures set forth in 7:19-2 are applicable to reallocations.

(d) Within critical water supply areas of the type described in (a) 2 and 3 above, the Department may require the following:

1. Special quality testing;

2. Reduction in the amounts of water withdrawn by users;

3. Substitution of alternative sources, as described in (c) above;

4. Artificial recharge, to prolong the life of the aquifer or to mitigate or delay salt water intrusion;

5. Substitution of a different aquifer for the one already in use.

(e) A reduction in withdrawal amount shall not exceed the amount considered necessary to reduce the aggregate withdrawal from the aquifer to the dependable yield from subsurface sources (see N.J.A.C. 7:19-6.2, Definitions).

(f) Within critical water supply areas of the type described in (a)2,3 and 4 above, the Department may require water allocation for all wells withdrawing between 10,000 and 100,000 gallons per day, exclusive of single family residences and agricultural and horticultural water use certifications.

(g) In specified portions of water supply critical areas of the types described in (a) 1 and 2 above, where access to an alternative water supply source would be unduly expensive, users may be allowed to withdraw their full allocation from the source in short supply, in accordance with the following:

1. Full allocation is compensated for by corresponding additional reductions on the part of other users; and

2. The Department has given prior approval to the arrangements for full allocations; and

3. The extra costs of the alternative source are or will be equitably distributed between all users within the critical area.

4. Reduction or other restrictions may be arranged through participation in a regional plan approved by the Department.

(h) Within critical water supply areas of the types described in (a) 1, 2 and 3 above, the Department may require additional measures for water conservation, metering and leakage control which are more stringent than those required elsewhere in this chapter.

(i) Within critical water supply areas of the type described in (a) 4 above, the Department may only institute controls and requirements required by interstate mandate unless the same area is also a critical area of the type described in (a) 1, 2 or 3 above. If so classified and mandated, the additional controls and requirements may include water allocation for diversions of less than 100,000 gallons per day, metering, added reporting requirements, restriction of inter-basin diversions, restriction of consumptive uses and water quality testing of wells.

(j) Any area, meeting the criteria of more than one of the critical area types described in (a) above, is subject to the requirements for each applicable type.

(k) Once established, a critical water supply area shall remain a critical area unless modified or designated otherwise by the Department, after determining that the reason(s) for the area's designation as a critical water supply area has changed or ceased to exist.

7:19-6.11 Critical water supply areas in other than the coastal plain

(a) The establishment of critical water supply areas in other than coastal plain aquifers will depend upon the geological conditions.

(b) In large areas of fairly uniform characteristics, such as pleistocene buried valley aquifers, criteria may be the same as for coastal zone aquifers.

(c) Where aquifer characteristics are irregular, such as hard rock aquifers and unstratified glacial deposits, such that delineation of lowered piezometic pressure zone is impracticable, only widespread pollution or the existance of general deficiency in water supply without practicable alternative sources, may be bases for establishment of a water supply critical area.

7:19-6.13 Public participation procedures for application of critical area requirements

(a) When the Department determines that a critical water supply area should be established or that arrangements should be initiated for water allocations other than proportionate to existing allocations with consequent financial adjustments in an established critical area, the following requirements shall be met:

1. A written explanation and request for action shall be sent to parties known to be directly concerned and to concerned municipalities and public interest groups.

2. Public notice shall be given and a public hearing shall be held.

3. Opportunity for written comments shall be given.

4. As appropriate, procedures under 7:19-2 shall be followed.

(b) Upon completion of the requirements in (a) above, the Department may issue an administrative order requiring establishment of the arrangements described in (a) above.

7:19-6.14 Administrative hearings

(a) A purveyor may apply in writing to the Department for an administrative hearing before the Office of Administrative Law within 15 days of receiving an order or other final decision pursuant to N.J.A.C. 7:19-6.6(a)3 and 6.8(a).

(b) An adversely affected party may apply in writing to the Department for an administrative hearing before the Office of Administrative Law within 15 days of an order or other final decision pursuant to 7:19-6.3(d), 6.10(a) and 6.13(b). Requests for administrative hearings relating to critical water supply area determinations under 7:19-6.10(a) may not stay the affect of such determination nor stay implementation of response measures associated with such determination.

(c) The request for a hearing shall specify in detail the basis for the request. The Department may attempt to settle the dispute by conducting such proceedings, meetings and conferences as deemed appropriate. Should the efforts to settle the dispute fail and should the Department determine that the matter is a contested case the Department will forward the request for a hearing to the Office of Administrative Law, pursuant to the provisions of the Administrative Procedure Act (N.J.S.A. 52:14B-1 et seq.).

7:19-6.15 Penalties

Any person that violates any of the provisions of this subchapter shall be subject to the remedies and penalties set forth in section 16 of the Act (N.J.S.A. 58:1A-16).

Senator **Bradley**. Thank you very much.

You mentioned that the State has 620 water companies. Are companies assigned a specific area, can consumers choose the company they want? Describe the consumer/company relationship.

Mr. **Gaston**. Well, you're a captive of your water utility, and the State water utility service districts are on either a municipal franchise basis or a public utility franchise basis.

The State has about 50 percent of its water that's furnished by investor-owned systems, which is a little bit out of character with that which occurs nationally. The remainder of the water is furnished by municipal systems of one form or another.

Senator **Bradley**. So 300 of the systems are investor owned?

Mr. **Gaston**. Probably—there might be 50 investor-owned systems that supply about half of the water, and there are probably 580 municipal or quasi-municipal operations. They may be community systems of one sort or another.

And a significant concern that we have in managing our system is that we do have so many entities and they are so small in many instances, and they're difficult to keep in line with all the requirements that exist in a water—modern water management program.

Senator **Bradley**. How is the price for water set?

Mr. **Gaston**. The price for the water is set by the utility and if it is a regulated, a BPU-regulated utility, it's set by the public utility commission.

So those that are regulated as public utilities definitely go there, and certain of the municipal systems that furnish outside their systems also go to the BPU. I would estimate that maybe 60 percent of the water delivered in New Jersey is, in one form or another, regulated through the BPU and the other 40 percent is set by an authority or a municipal governing body.

Senator **Bradley**. So that all of the prices of water are set by a governmental entity.

Mr. **Gaston**. Of one form or another; yes.

Senator **Bradley**. Does it make any sense to have this centralized? You remarked that it doesn't make sense to have 500 separate water companies. Should the price-setting mechanism also be more centrally located?

Mr. **Gaston**. Well, you're asking a question that we have thought about a great deal. Fortunately, being from the Department of Environmental Protection, we always say that we're proud and delighted that there is a board of public utilities that can assist in the ratesetting process, and that that's in Newark and that we're in Trenton. But aside from that, why there have been different views about ratesetting and the need for a centralized handling of that function. Since most of the major systems are covered through the BPU, we've got at least three-quarters of a yes to your answer.

Whether or not it makes sense to have municipal systems that are directly accountable the electorate up at the BPU is an open question. I would probably fall on the side of saying no, since the voters do have a shot at their representatives through the municipal electoral process.

Senator **Bradley**. I'm sorry. So, have you said yes or no?

Mr. **Gaston**. I'm saying yes to the fact that most of the water is regulated already. Whether we should move everybody to Newark and have them regulated by the BPU, to me is an open question. And given the fact that many of those systems are directly accountable to voters, I don't know whether you need to have the pricesetting mechanism twice established.

Senator **Bradley**. What if you had the BPU dispersed to five areas of the State?

Mr. **Gaston**. New Jersey is such a small State that it is convenient to run it out of Newark. They do hold hearings, I believe, in local jurisdictions.

Senator **Bradley**. No; I'm referring to your statement that prices are set by different authorities, versus centralizing it in the BPU. You claimed there was an advantage to having it set by a lot of different authorities. And you wouldn't centralize it because you wouldn't want it all in Newark.

So I'm saying fine; let's reduce the number from 500 to 10.

Mr. **Gaston**. Well, where we would very definitely agree, Senator, is that there ought to be less water utilities in New Jersey, and I think that's the place where we can get the most benefits. If you told me tomorrow, you had a way to get us down to three, or two, like we have in the electric power industry, you'd have one very happy Director conversing with you.

Senator **Bradley**. OK.

Let me ask you about your comment on ground water. Mr. Cohen, through the questioning process, described an enormous amount of ground water in the south and east in New Jersey, essentially the pine area.

You, in your testimony, said we have to look at reducing the amount of water we take out of the ground, and you gave as the reason the Camden, Atlantic City, and Lakewood depression areas.

Do we have to be careful about the ground water we take out in that area, or do we have to be careful about the ground water we take out wherever? It seems to me that the quantity of water available in the southeastern part of the State is enormous, and I read your statement to be saying you should reduce ground water. I don't think you meant to say we should reduce ground water, except around the depression areas. Is that correct?

Mr. **Gaston**. We need to manage ground water much more effectively in areas that are overstressed, and obviously in areas where there is abundant ground water it's available to be utilized and regulated in the best interest of the citizens of the State.

I might say, though, that this question of how much water in the pine barrens is a question that needs to be carefully considered because the pine barrens are a unique ecological asset and when one takes that as a base condition for use of pinelands water, there may not be as much water as we think there available to be utilized elsewhere. And just the thought of doing a test well adjacent to the pine barrens has filled up my in basket with mail, and I'm sure you've received some as well.

Senator **Bradley**. Yes, I have.

Mr. **Gaston**. So we're most sensitive to the public attitude as well as the important environmental questions that go along with balancing water use with environmental protection.

Senator **Bradley**. So you're saying essentially that the broad support for this unique Federal/State/local preserve, the pine barrens, is one of the issues here; since there's such strong support, it's a direct affront to the public sentiment that has developed.

Is that what you're saying?

Mr. GASTON. I'm saying that, and also that if we are going to develop a program to utilize those waters, it's going to have to be backed up with scientifically defensible information that gets acquired over a period of time.

Senator BRADLEY. You mentioned the State is considering obtaining water from the Hudson River. How would that work? Who would be responsible? Would it be the Delaware River Basin Commission?

Mr. GASTON. I guess what we're saying is that given the fact that the region as a whole is experiencing water problems, and that some examination is going to be made of the Hudson as a potential for solving that problem, we would like New Jersey to be part of the discussions that would take place.

Now, the "how" part of it is a much more complex question as to whether it would be an agency like DRBC, or, you know, a Federal agency of some sort—is really something that would have to be worked out. But at this very preliminary state, where I think everybody can agree that there is a need to produce additional water for the long-term benefits of the region, we would like to be part of those discussions and perhaps take advantage of some of the water for our long needs.

Senator BRADLEY. Are you saying that the Delaware River was, in part, used to meet the needs of New York, and therefore that the Hudson River should meet the needs, in part, of New Jersey? I assume you'd make the same argument on the Susquehanna?

Mr. GASTON. Conceivably, yes; that the regional——

Senator BRADLEY. Therefore there are three different systems that are of benefit to the region. It is best to view matters on a regional basis, as opposed to a local basis—this river for you, this river for you, and this river for me.

Don't you agree?

Mr. GASTON. Well, yes——

Senator BRADLEY. Isn't that the rationale for your suggestion?

Mr. GASTON. Yes; I think we've shown that at the intrastate level. In the last 5 years we've knit together our water systems, the major surface systems up in the Northeast. We've provided interconnections. Those that have extra water this year are serving those that don't have enough water this year. As a consequence of the prudent management of the system, our reservoirs have gone from about 60 percent in April to about 78 percent now, with a little help from Mother Nature, admittedly, but it was the active management of the resource to everyone's interest that produced the results.

Senator BRADLEY. How do you account for New Jersey removing its drought warning almost the same week that New York City imposed a drought warning?

Mr. GASTON. I think that it's fair to say that we got scared early and that we acted early, and that we acted in a variety of ways, and that we had marvelous support from the public in the actions that have been taken. And as a result, we saved about 12½ billion gallons of water that would have been lost or used, but sitting in our reservoirs now to be used in the fall.

Senator BRADLEY. Are you saying that New York didn't conserve as much water?

Mr. GASTON. Well, the lesson of the drought of 1980 and 1981 was we waited, and we didn't wait this time. We acted. And, as a consequence, we're in a lot better shape.

Senator BRADLEY. So you don't want to comment on New York?

Mr. GASTON. Well, we have a difficult time operating our side of the management system.

Senator BRADLEY. You described the State's view on future needs, and that you want to put in place a water system that can be expanded to take account of what those needs are. Would the Hudson River project satisfy those needs?

Mr. GASTON. No. Actually, in the water supply master plan that was adopted in 1982, one of the basic assumptions and goals was to control the parameters that we could control. So we placed maximum emphasis on dealing with the problems of intrastate management of water, connecting up our systems, and providing a framework for regional management, such as is taking place here in the Potomac Basin to produce extra work from the same capital assets.

We did that back then. We've been following through on it. We utilized the emergency projects from the last drought to improve the connectibility of the systems. We made a firm commitment to produce new water for New Jersey for the first time since Spruce Run and Round Valley Reservoirs were built in the last 1950's.

The Wanaque South project will come on line in North Jersey and if we had it now, we wouldn't have a drought warning up there. The 12 or 25 systems that had been brought up as systems that are beyond their safe yield will be back in balance again as a consequence, or many of them will be back in balance as a——

Senator BRADLEY. When will that be finished?

Mr. GASTON. That will be finished late next year. The reservoir to go along with it—Monksville—will be finished in early 1987. But I might add, it's already being used now to skim off extra flow from the river system and to transport water to Hackensack Water Co. which had severe problems in the 1980–81 drought and is now sitting with about 70 percent of water in its systems.

I was saying that we have Wanaque South. We are actively developing the Manasquan Reservoir down in Monmouth County to meet the needs that go along with the critical area designation. We are rehabbing the Delaware and Raritan Canal, spending money to make our Delaware River allotment of maximum availability to us. The Merrill Creek project is being done by private utilities and will produce more water for the needs in the Delaware Basin, and New Jersey is an active participant in the discussions for Prompton and F.E. Walter to meet our low flow obligations under the good faith agreement.

So we're doing all those things and utilizing different sources of capital to do them, and when they all add up, the financial commitment is over $500 million to new water supply, which is——

Senator BRADLEY. Therefore, the $350 million will be easily used.

Mr. GASTON. That's right. We've had some discussions about that, Senator, and what we've tried to do is use the $350 million to do things that we can't do any other way. We've been creative in trying to figure other ways to get big and major activities——

Senator **BRADLEY**. What are those things, specifically?

Mr. **GASTON**. I mentioned the F.E. Walter and the Prompton projects we hope will be financed through the Delaware River Basin Commission, using water fees that the basin users will pay. One way or the other, the users will pay for those fees.

Senator **BRADLEY**. What are items that can't be financed any other way but the bond issue?

Mr. **GASTON**. Well, the rehabilitation of the Delaware and Raritan Canal was financed out of the bond issue. A good share of the Manasquan project will be financed out of the bond issue.

We will also be financing part of the Wanaque South project, the public part of the Wanaque South project out of the bond issue. So those major things will be financed out of the bond issue.

Senator **BRADLEY**. What will the cost of those three projects be?

Mr. **GASTON**. Twenty million dollars for the D&R Canal, $72 million for Manasquan, and between $50 and $70 million for the Monksville Wanaque South project.

Senator **BRADLEY**. So we'll still have $100 million?

Mr. **GASTON**. Well, we have about $100 million that's not spoken for. Yes; we have an extensive program of rehabilitating water systems that's been begun on a loan basis for municipal systems and we will have $100 million set up in a revolving account, an infrastructure bank, in effect, for water supply rehabilitation later on this year.

Senator **BRADLEY**. So the $70 million, $70 million, and $20 million adds to $160 million.

Mr. **GASTON**. Right.

Senator **BRADLEY**. The $100 million for the resolving loans brings us to $260 million. So you've spent about $100 million?

Mr. **GASTON**. We have about $100 million that's not committed. None of this has really been spent. It's allocated and will be taken down as the projects are——

Senator **BRADLEY**. But if you have $350 million, and $100 million of that is unspoken, that leaves $250 million. Three main projects cost $160 million, that leaves about $90 million.

Mr. **GASTON**. The math is worked out in appendix 1 to my report here.

Senator **BRADLEY**. OK, fine. I'll read it.

Mr. **GASTON**. You can do that in your leisure reading.

Senator, we have had quite a few questions raised regarding the spending and the bond issue.

If you need any further material, we'd be glad to furnish it.

Senator **BRADLEY**. As someone who is very active at the State level and has developed a comprehensive plan for water use in one State is there any suggestion you could make about better utilization of Federal resources from the standpoint of New Jersey?

Mr. **GASTON**. Let me answer that by saying that the figures, the capital figures that you had for New York, which were about $38 billion of needs for water supply, we don't have as good a figure right now. On the wastewater side, New Jersey's infrastructure needs about $4 billion under the Clean Water Act, the categories of the Clean Water Act. I would estimate that in the water supply area, that before we get done, we'll be working with a number that's similar to that. That's just a real crude estimate in terms of what our needs are.

We're going to have to rehab a lot of the systems.

Senator **Bradley**. Is similar to $38 billion?

Mr. **Gaston**. To $4 billion. About $4 billion. We're going to have to rehab a lot of our systems. There's water treatment systems that are going to have to be built, some that are on line, others that are going to be needed.

Senator **Bradley**. Did you work with the corps on the Jersey City project?

Mr. **Gaston**. Yes, sir; we did. Those—this is a long way to get to a direct answer to your question. We need to be able to work with the corps, we need to be able to work with USGS, because the technical resources and sometimes the financial resources of both those organizations can extend our ability to do the job that we've lined up for ourselves that in some respects is just too much for just one State to do.

Senator **Bradley**. So technical and financial resources. Do you think you've worked well to gether, or do you have anything to suggest to them?

Mr. **Gaston**. Well, in our testimony, we had a few suggetions as to where we might go. We have, I think, one of the largest cooperative programs with the U.S. Geological Survey as exists in the United States. We're studying, very carefully, our ground water resources and we're going to try and make better decisions as a consequence of that.

With the Corps of Engineers, there's a lot of work that has to be done in the water supply area to understand our infrastructure and to go about solving the problems, and we'd like to improve upon our ability to draw on their resources, both through implementing NEWS, and also some of the specialized language that's been developed in congressional authorizations to use the corps.

Senator **Bradley**. Would you like to have section 214 apply to New Jersey?

Mr. **Gaston**. I had that on my last year's Christmas list, and it'll be on next year's Christmas list also.

Senator **Bradley**. Thank you very much, Mr. Gaston, for your testimony. The hearing record will remain open for 2 weeks to receive any further written materials. I think I've asked a number of witnesses to do that.

The hearing is adjourned.

[Whereupon, at 12:45 p.m., the hearing was adjourned, subject to the call of the Chair.]

# WATER SUPPLY ISSUES IN THE MIDDLE ATLANTIC STATES

---

## TUESDAY, AUGUST 6, 1985

U.S. SENATE,
SUBCOMMITTEE ON WATER AND POWER,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
*Hackensack, NJ.*

The subcommittee met, pursuant to notice, at 10:35 a.m., in Freeholder Chambers, County Administration Building, 40 Hudson Street, Hackensack, NJ, Hon. Bill Bradley presiding.

Present: Senator Bradley.

Also present: William B. Conway, counsel for the minority.

Senator BRADLEY. The Subcommittee on Water and Power of the Senate Committee on Energy and Natural Resources shall come to order.

Before I begin with an opening statement, I would like to take care of some housekeeping matters. First, I would like to express my appreciation to Carl Hartmann, who is the clerk of Bergen County, for making this hearing room available, and here is a signup sheet on the table next to the door, if you would like to receive a copy of this morning's hearing record. The record will remain open for 2 weeks for submission of additional materials.

Anyone who would like to submit, amplify, clarify, or add to the hearing record can do so simply by mailing those comments to the Committee on Energy and Natural Resources, Subcommittee on Water and Power, Senate Dirksen Building 358, Washington, DC 20510.

## OPENING STATEMENT OF HON. BILL BRADLEY, A U.S. SENATOR FROM THE STATE OF NEW JERSEY

Senator BRADLEY. I want to thank you for attending today's hearing, in which we will learn about water issues of importance to the mid-Atlantic region. Our Nation has been divided historically into two water supply regions. Dry conditions prevail in our Western States, where the average rainfall is a mere 15 inches per year.

As a result, these States have been forced to deal with the difficulties associated with consistently scarce water resources. That condition is contrasted with the 45 inches of annual rainfall enjoyed by the Eastern United States. In fact, the abundance of this resource has been an integral part of the development of our region. The result has been very different water management policies, and even very different water supply psychologies.

The severe drought during the 1960's as well as the past 5 years of on-again, off-again drought warnings have increased public discussion of water supply issues in the Eastern United States. We who live in this region cannot take our plentiful water supplies for granted.

An increasing amount of attention is being given to our Nation's emerging water supply crisis. But we have to distinguish the availability of useful water with the supply of the natural resource itself.

I would like to repeat. We have to distinguish between the availability of useful water with supply of the natural resource itself. Until that is done, the public is likely to believe that our water supplies, when we use the word crisis are diminishing.

The fact is that we as a Nation consume only 7 percent of our renewable water supply. Under those circumstances, I question the use of the terminology water supply crisis. How can we reconcile the abundance of the natural resource with the obvious scarcity of available water? It is my belief that we are suffering the results of inefficient long-range planning and management of water supplies.

Therefore, in order to best meet our future needs, it is important for us to examine the issues more carefully, determine where the problems are, and develop long-range strategies.

This is the second in a series of three hearings on water issues in the mid-Atlantic region. The first hearing took place on July 22 in Washington, DC. At that time, we heard from those Federal agencies with primary responsibility for the water supply issues in the United States. The U.S. Geological Survey is the Department of the Interior's principal water information agency. It collects, evaluates, and disseminates data on all aspects of the Nation's water resources.

Dr. Dallas Peck, the Director of the USGS, raised two very important points in our first hearing. First, he said there is more than ample rainfall to meet the demands of the mid-Atlantic region. The thrust of our efforts must therefore be directed at better water management.

Second, Dr. Peck informed us that the ground water supplies in the Pinelands region of New Jersey is substantially greater than the present surface water supplies in the State.

Additional testimony was provided by Brig. Gen. Paul Kavanaugh of the North Atlantic Division of the Army Corps of Engineers, and by Mr. Richard Atwater, special assistant to the Commissioner of the Bureau of Reclamation. The two agencies, the Bureau of Reclamation and the Corps of Engineers, represent the two agencies with the major Federal responsibility for the storage, transportation, and general utilization of water.

Mr. Atwater made it clear that their ground water experiences in the Western States are directly applicable to the Eastern States. In addition, Mr. Atwater informed us of the ease with which present engineering and technology is able to move water over great distances, in some cases as far as 500 miles. This has clear implications for interbasin connections in the eastern part of the United States.

Brigadier General Kavanaugh made special mention of the need for a Hudson River project to meet the water demands in the mid-

Atlantic region. In fact, it was the opinion of the Army Corps of Engineers that if such action had been taken as recommended in their Northeastern Water Supply Study, the so-called NEWS study, the difficulties presently encountered by New York City would not exist.

Brigadier General Kavanaugh also stressed the need for infrastructure improvements in the region.

Our final witness on July 22 was Mr. John Gaston, the director of the New Jersey Division of Water Resources. Mr. Gaston provided us with a comprehensive review of State action taken to meet both the present and long-range needs of New Jersey residents. This included the need for New Jersey to reach beyond its borders for sufficient water supplies after the year 2000.

Today as well as tomorrow we will delve into the non-Federal perspectives on these issues. We will hear testimony from State and local governments, citizens' groups, and water suppliers.

Let me emphasize that we are here to learn, to listen. I look forward to your reactions to the issues raised at our Washington hearing. Also, there are numerous questions which we want to explore in today's hearing. How do present water supplies compare with demand? What are the projections of the future supply versus demand?

If supplies are predicted to be overly strained, should our priority be conservation programs or development of new sources for water? What steps can be taken to motivate consumers to conserve during both dry and wet times? What are the most cost effective types of water projects? Should we try to combine flood control projects with surface water storage for potable purposes?

Should we emphasize interbasin connection, intrabasin connection, or point of use at the source? Who should bear the costs of all these projects? And in general, what is the appropriate role for the Federal Government in water management?

I look forward to the witnesses dealing with these questions as well as making their own comments about the subject of today's hearing. To begin, we have as our first witness Mr. Langdon Marsh, who is executive deputy commissioner of the New York State Department of Environmental Conservation.

Do you have a statement you would like to submit for the record, Mr. Marsh? Welcome to the committee. Take a few minutes and offer us your perspective.

## STATEMENT OF LANGDON MARSH, EXECUTIVE DEPUTY COMMISSIONER, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Mr. Marsh. Thank you, Senator.

My name is Langdon Marsh. I am executive deputy commissioner of the New York State Department of Environmental Conservation. My department is New York State's Water Resource Agency.

I appreciate this opportunity to provide the State's perspective on water resource needs related to the Delaware Basin. The basin is of vital concern to us because it provides almost half of New York City's water supply. The current drought has severely impacted southeastern New York, which includes the headwaters of the Delaware Basin——

Senator **Bradley**. Please pull the microphone a little closer to you so that the people in the back can hear you.

Mr. **Marsh**. The drought has severely impacted southeastern New York, which includes the headwaters of the Delaware Basin and New York City's major watershed areas.

On July 10, Governor Cuomo declared a drought disaster emergeny for eight counties in southeastern New York and New York City. The Governor directed implementation of the State Disaster Preparedness Plan and applicable portions of the State Draught Preparedness Plan, and authorized State agencies to take all appropriate actions to provide assistance to those affected localities in protecting the public health and safety.

The Governor also enjoined all affected communities in the State to take appropriate water conservation and drought contigency planning actions.

New York City is now in stage 3 drought emergency status, with severe restrictions on water uses, and has activated an emergency pumping station on the Hudson River for an additional 100 million gallons per day supply.

Westchester County, which receives 85 percent of its water from the city's system, is in similar emergency status, and Rockland County, which has its own supplies, has also declared a water emergency.

The eight-county area including New York City is one of the principal economic centers of the United States. It is vital that its water supplies be protected. This is not a new problem, and it is complex. The current Delaware River water use is subject to a 1954 U.S. Supreme Court decree and the Delaware River Basin Compact. The Delaware River Basin Commission, local municipalities in and out of the basin, and the four basin States and New York City have a vested interest in and work hard at the protection and best use of the waters of the Delaware.

My department is concerned about managing water resources to ensure the provision of adequate supplies for those who need it. Uses include water for drinking, for agriculture, for industry, as well as water to protect the valuable ecological habitat.

The current drought and limited supplies are hurting our ability to do this job. In New York City and those communities dependent on the city supply, normal annual withdrawal demands are 15 percent over available supplies. Peak summertime use strains the ability of the existing transmission system such that adequate pressures and flows cannot be maintained, despite storage in the reservoir.

It is evident that the dimension of the problem goes beyond the capture of enough water for various types of uses. It involves adequate transmission and treatment facilities. It involves sufficient reservoir release regimes to protect fish and wildlife habitat and other in-stream users.

Realization of these objectives requires cooperation. Paying for them is always a problem. The infrastructure need to implement the objectives does not come cheap. In this regard, the Federal interest in single purpose water supply has been nearly nonexistent. We believe that there is an important Federal role to be played.

First, the section 214 program authorized in Public Law 89-298 to provide water resource planning assistance should be funded at $1 million annually to help us develop basic information on how to better use and care for our existing water supply infrastructure. Congress authorized $1 million for this but no funds were provided by the administration this year.

Second, continuing planning and engineering studies for the northeastern U.S. Water Supply Study, the NEWS study, has been sought annually at $1 million to assess the current water supply deficit in light of changed population and growth projections, and reevaluation of alternative solutions which consider environmental problems and allow preliminary work related to the city third water tunnel are needed as well.

Third, the Federal Emergency Management Agency's role in the current drought emergency needs to be expanded. Federal authority must be clarified and strengthened if necessary to provide needed Federal assistance.

Drought is not a sudden occurrence. It can be severe and have long-term hardships. Necessary aid should not be jeopardized by a narrow definition of Federal responsibility that depends on an easily recognizable act such as a flood.

Fourth, water supply has traditionally been paid for by State and local governments. The ability to pay for improvements is now threatened. As I said earlier, the infrastructure does not come cheap. Billions have been invested and billions more are needed to protect the investment.

It is in this context that we strongly oppose the President's tax proposal to the Congress published in May 1985. Specifically, we oppose those portions of the proposed tax law which restrict tax-exempt financing options of State and municipal government.

In today's market, the difference between the tax-exempt and tax market for high-grade securities is about 250 basis points. This means an increase of total cost of $500,000 to finance a $1 million project in the tax market as opposed to the tax-exempt market, this over a 25-year period.

A fundamental shift in the tax burden is at stake that adversely affects the State and local taxpayers. Combined with the loss of deductibility for these taxes, the impact on providing infrastructure improvements will be devastating.

Returning to the role of the Corps of Engineers in water supply, 8 years have passed and the additional evaluations called for in the NEWS study have yet to be initiated. We have continually supported funding for these additional studies and for review of the Corps of Engineers of construction drawings of the city tunnel No. 3 pending further Federal involvement.

This is now needed. Costs for these initial studies are estimated at $15 million, and we are requesting $1 million for the fiscal 1986 year.

Along the same lines, House Report No. 98–308 on the fiscal 1983 supplemental appropriations bill noted the conference committee's concern over the water supply problems of the Greater New York area and directed the Corps of Engineers to address the situation.

In January 1984, the corps completed the New York Metropolitan Area Water Supply Study—NYMS—which contains good information on water supply issues. We urge that further consideration be given to the problems identified in the report, which is entitled New York Metropolitan Area Water Supply Study, as soon as possible.

However, we disagree with the conclusion drawn in the corps testimony on February 8, 1984, which suggests that the Hudson River project portion of the NYMS is only of local interest. The NYMS made the point that the national interest is at stake, yet the written conclusion of the report says just the opposite.

As further evidence of the need for Federal interest in this problem, the State of New Jersey, as I mentioned, Senator, has supported the Hudson River as a long-range alternative source. Clearly, there should be no doubt that the problems and solutions to the Delaware Basin States' water resources issue are regional, even national in scope.

Indeed, the corps' testimony elsewhere stated the third tunnel minimizes the possibility of a major system failure that would create extreme national stress.

Senator, your subcommittee over years has authorized many water supply projects in the west. My staff has calculated with jocularity that the water from these projects would cover all of New England with 3 feet of water, and they irrigate an agricultural complex twice the size of your State.

The water supply needs of this region are equally important. They deserve attention. Yet the Federal Government does not recognize them as needs. It is time this policy was changed.

Thank you.

Senator **Bradley**. Thank you very much, Mr. Marsh, for your testimony and for your positive suggestions. I think they are very helpful, and it is important that the record reflect your concerns.

I would like to pursue this question of the Hudson River project. Is your position that you support the Hudson River project?

Mr. **Marsh**. The State's position has been that starting with Governor Carey in 1977, I believe, that the State has supported the Hudson River project subject to the completion of a variety of studies of both demand, conservation alternatives, and ecological impacts, and we have supported, as I mentioned in the testimony, over this past 8 years the funding of studies by the Corps of Engineers to carry the project forward and go through those alternative analyses and impact analyses so that the project can be evaluated for funding and possible Federal support.

Senator **Bradley**. If one was to ask you why the project hasn't been built, what would you say?

Mr. **Marsh**. Well, of course, the building of the project would have taken far longer than the 8 years that have intervened, even if it had been fully authorized and approved up to that point.

I think that the—there really are two answers. I am anticipating a little bit Commissioner McGough's testimony, which will go into this in more detail, but the city has proceeded with a major portion of the Hudson River project, which is the construction of the third city water tunnel using its own resources. A very large portion of the total cost of the Hudson River project is that tunnel.

Senator **Bradley**. Do you have dollar figures for the tunnel?

Mr. **Marsh**. Commissioner McGough—I think you should rely on his numbers. They are in his testimony.

The other answer is that we have not received the kind of Federal support that was indicated at the time the project was analyzed to do these additional studies and prepare the way for actual authorization and construction of the project.

There are a great many questions that need to be resolved, and there are a number of interests, both municipal and environmental organizations and others, who would like to see those questions answered before a final decision is made, and the State government would like to see them answered as well.

The tremendous financial burden that that project entails has also been a hindrance to its being carried forward.

Senator **Bradley**. Would you say cost is the main problem?

Mr. **Marsh**. I would say cost is the main problem, followed closely by a need to know what the alternatives in terms of conservation, other sources of supply, and the third level would be the ecological impacts of the project.

I think there is also a fundamental question about the scope of the project which I think the testimony already received indicates as to how much is appropriate to be devoted to New Jersey and how much to other municipalities within the State of New York.

Senator **Bradley**. You mentioned conservation. Do you think there is sufficient metering in New York?

Mr. **Marsh**. No; I don't. I think I have been very pleased with the study's recognition over the past few years of the need to do more metering in the city.

Senator **Bradley**. Can you estimate the amount of water that could be saved if there was more efficient metering?

Mr. **Marsh**. I would only be guessing, but given the fact that the city's own targets for conservation during this third stage drought emergency is about 25 percent of industrial and commercial uses, I would think that that would certainly be a minimum target for conservation within the city.

Senator **Bradley**. Could you explain the role metering plays in conservation?

Mr. **Marsh**. Well, we operate the water resource permitting program in the city of New York which requires a permit before the taking of or expansion of any new water supply by a municipality or private purveyor. In all of the cases that we have approved over the past number of years, we have required metering as a condition of the permit.

I don't have the exact figures at my fingertips, but it certainly is a marked difference between those areas of the State which are metered and those which are not. I can provide those statistics to you for the record.[1]

Senator **Bradley**. I wish that you would provide those for the record, because it gives us some basis upon which to make specific recommendations about metering.

---

[1] The information was not received to be incorporated in the printed record.

Any other action that you think could be taken to improve the conservation of water? For example, what about the cost of water? Is it properly priced? Or do you think it should reflect full cost of the projects?

Mr. **Marsh**. I think that it is generally believed in our State, at least, that water is an underpriced commodity, and that there is room for most, not all, but most municipalities and purveyors to increase water rates to take care of some of the additional needs and demands that have been imposed on the water systems these days, including infrastructure improvements, treatment, and expansion of supply.

I believe that in the coming years, particularly if some of these Federal tax proposals are enacted, there will be a much greater need to put the water systems on a more self-sufficient basis, and we certainly are very amenable to looking at new kinds of institutional arrangements for the financing, particularly of infrastructure improvements in water supplies.

Senator **Bradley**. Could you give me a relative price for water today versus 10 years ago?

Mr. **Marsh**. No, I could not, but I could provide that for the record, certainly.[1]

Senator **Bradley**. Would you have any guess at this stage? Has water stayed the same in price?

Mr. **Marsh**. Well, I am not familiar with statistics, but I know from my own experience living in an upstate community near Albany that water has not increased very dramatically in price over the past 10 years, and I would imagine the experience in most other State areas is much the same.

I would invite you to ask the same question of Commissioner McGough, who may have statistics on New York City.

Senator **Bradley**. I will.

Mr. Marsh, thank you very much for your testimony.

Mr. **Marsh**. Appreciate it. Thank you very much for your interest in this area.

Senator **Bradley**. Our next witness will be Commissioner Joseph McGough, Jr., if he is here, commissioner, New York City Department of Environmental Protection.

Commissioner McGough, welcome to the hearing. I look forward to your testimony.

## STATEMENT OF JOSEPH T. McGOUGH, JR., COMMISSIONER, NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Mr. **McGough**. Thank you very much, Senator.

I have delivered to you copies of my statement which you may want to distribute.

Good morning to you, Senator Bradley. My name is Joseph McGough. I am commissioner of the New York City Department of Environmental Protection, the agency having jurisdiction over the city's water supply system.

I welcome this opportunity to appear before you to discuss the city's water supply concerns, concerns which affect not only New

---

[1] The information was not received to be incorporated in the printed record.

York City but New York State, the States of New Jersey, Pennsylvania, and Delaware, and indeed the entire United States.

In my testimony I would like to do three basic things: discuss the city's major water supply concerns and our plans to address these; make absolutely clear the city's position on the Corps of Engineers proposal for a high flow skimming project on the Hudson River; and finally, outline our present drought-related activities.

The water supply has always been of vital concern to New York City, dating back to the 1830's. The city is engaged in a long-range planning and development associated with delivering an adequate supply of potable water to its citizens.

The city's oldest source of supply derived from the Croton System located in Westchester and Putman Counties, which went into initial service in the early 1840's. That system continues in use today, and is a vital part of our overall supply. About 10 percent of our water comes from that system.

The Catskill System, our second largest source of supply, representing about 40 percent of our current daily demands, was developed in the early years of this century and placed into service in 1916. The third and largest component of our system is the Delaware supply. The Delaware supply is comprised of three impounding reservoirs and tributaries to the Delaware River and a collection reservoir which is tributary to the Hudson River.

This system now provides us with 50 percent of our daily needs. The three Delaware reservoirs feed the collecting reservoirs through deep rock tunnels which pass under the mountain range separating the Delaware and Hudson River watershed. From this collecting reservoir water is then delivered to the city of New York through a series of other reservoirs.

As with any water supply, our primary concerns are basic ones: adequacy of supply, No. 1. No. 2, quality of that supply. No. 3, adequacy of the transmission facilities to deliver that supply. And No. 4, the distribution facilities to get the water to the consumers.

While these are basic concerns, different priorities are assigned to different aspects of the overall problem, depending upon the needs at any particular time. We have budgeted $3.75 billion over the next 10 years to meet these needs, all city funds, I might add.

For over a decade and a half, the city's major effort in long-range planning has been focused on the need to construct the third city water tunnel. This tunnel is urgently needed, not only to meet the continuing needs of the people of the city of New York for an adequate supply of water at usable pressures, but also to ensure against catastrophic loss of supply if one of our two existing tunnels has to be shut down under emergency conditions.

Furthermore, Tunnel No. 3 is an essential component in any plan to expand existing supplies such as the high flow skimming project.

Following close behind Tunnel No. 3 in priority is a long-range plan to construct the city's first water filtration plant. This facility is scheduled to go into service in 1994 to filter about 10 percent of the supply supplied to our current system.

Finally, we must upgrade the condition of our dams and impound our upstate reservoirs.

The above activities are budgeted for $2.46 billion in our current 10-year plan.

Ranking just behind these projects is the need for the city to upgrade its basic infrastructure, the trunk mains, and distribution mains that make up the city's water main network, over 6,000 miles. We have budgeted $1.24 billion for this purpose in our 10-year plan.

In addition to the above, a total of $49 million has been allocated for a citywide telemetry system and preparation of new computer-drawn distribution maps, upgrading our existing emergency pumping station on the Hudson River, and making miscellaneous improvements to our overall physical plant.

As can be seen, New York City is committed to doing its utmost to protect and improve its overall water supply system. Some of the news reports issued after your committee meeting held recently in Washington, DC, on July 22 may have created the impression that the city did not and does not support the Corps of Engineers proposals for a high flow skimming project on the Hudson River.

On the contrary, the city supported the high flow skimming project from its original public hearing in March 1977. At that time, one of my predecessors, Robert Low, then administrator of the New York City Environmental Protection Administration, the predecessor agency, issued a public statement specifically endorsing the corps proposal.

That support was reinforced by a letter from then Mayor Abraham Beame to then Governor Hugh Carey again endorsing the project, and again in 1979 our current mayor, Mayor Koch, added his support to the project in a letter again to Governor Carey.

Since that time the city has repeatedly tried through its elected representatives to have the Congress appropriate additional funds so that the corps could finalize the work that was done in the late 1970's. In the seventies, a number of concerns were raised about the long-range demand projections in the corps report.

Many people felt that those projections needed refinement, and that additional studies were required. Recent congressional recognition of the continued need for these studies has not, unfortunately, resulted in any action being taken.

The conference report on the fiscal year 1984 supplemental appropriations stated, and I quote:

> The conferees are very concerned with the water problems of the Greater New York Area, including those of both ground water and surface flows. This problem threatens the security of a major metropolitan area of the United States. Herefore, the conferees direct the Corps of Engineers to use available funds to prepare a plan of action to address this problem. Also, the division engineer, North Atlantic Division, is to include in the statement of the fiscal year 1985 budget a funding schedule and necessary draft legislation to facilitate an expeditious resolution to this water supply problem.

Although a report was prepared, no funding schedule or legislation was recommended. In response, the fiscal year 1985 energy and water appropriations instructed the corps again to provide up to $1 million of continuation of planning and engineering funds for the Northeast Water Supply Study. No funds, however, have been made available. We continue to urge funding for this purpose.

Although additional studies were thought to be necessary to resolve certain demand projections, there was no issue in dispute regarding the delivery conduits south of Kensico Reservoir required to convey the water to the demand centers in the region. These delivery conduits are what we call City Tunnel No. 3.

While we agreed on the need for additional planning studies, we also recommended that final design proceed on plans for the delivery conduits since there was no reason not to move forward with that aspect of the project.

Since no Congressional action was ever taken and no funding provided for either the additional studies or construction of City Tunnel No. 3, the city has moved on its own to construct those vital transmission facilities.

It is sometimes overlooked that of the total cost of the high flow skimming project estimated at $3.7 billion by the Corps of Engineers in 1976 more than half, $2.34 billion, was for stages 1, 2, and 3 of City Tunnel No. 3, while $1.36 billion was to be expended on construction of the actual Hudson River intake pumping station treatment plant and delivery tunnel to the Kensico Reservoir in Westchester County.

In today's dollars, the total project would cost $6.78 billion. The upstate work would cost $2.49 billion, and the work required to complete the first three stages of the third tunnel would be $4.29 billion.

A careful look at these numbers will indicate that not only did the city support the high flow skimming project, but when no Federal funds were forthcoming, we undertook to construct the most expensive portion of it; namely, stages 1, 2, and 3 of the tunnel.

Such an undertaking demonstrates the city's support for the idea. The city remains committed to the concept of a high-flow skimming project on the Hudson River. We would welcome any support you could give us either to urge the corps to make funds available as directed in the 1985 appropriations, or through additional legislative action, including authorization of water supply projects.

Stage 1 of tunnel No. 3 is actively under construction and is expected to go into full service at the end of 1990 or at the very beginning of 1991. Upon completion it will have a cost of approximately $1 billion, entirely city funded.

Stage 2 of the third tunnel is budgeted for $1.8 billion in our current 10-year plan. We now expect that the Brooklyn-Queens leg of that tunnel will be virtually completed by 1995. The Lower Manhattan leg will probably be completed some time around the year 2000.

There have been no present budgeting plans developed for construction of stage 3. However, I am fully confident that this will be done so as to allow sufficient time for the construction of this vital segment of the overall third tunnel system.

While the above addresses the city's long-range water supply concerns, we cannot overlook the need for measures to see us through the current drought. There are no prospects for the city obtaining an additional source of supply in the near future.

Past experience indicates that major new supply projects take a minimum of 20 years to construct. Indeed, if work had started in earnest on the high flow skimming project in 1977, when it was first proposed, it would be less than half completed at the present time and of no use during the current drought.

We have, therefore, focused on doing everything we can to make our present supply stretch as far as it can. We are currently in stage 3. The draught emergency stage 3 regulations impose strict conservation measures. Our commercial, industrial, and institutional water consumers are required to reduce consumption by 25 percent compared to last year.

All those customers, I might add, are metered. All commercial carwashes are required to meet an August 1 deadline to submit plans for transmission to 100 percent private well water. It is otherwise illegal to wash any vehicle except for the windshields and windows for safety reasons.

Buildings with water-cooled air-conditioner systems are required to shut down the system from 8 a.m. to 10 a.m. or 4 p.m. to 6 p.m. and maintain a minimum temperature of 78 degrees when the system is operating. Other drought restrictions such as bans on lawn watering, using a hose to wash a sidewalk or driveway, opening a hydrant, operating a fountain, and filling a swimming pool or washing a car are also in effect.

We have an intensive enforcement effort to complement these regulations. We have diverted personnel from other areas of the department in order for enforcement to become the real teeth to declared restrictions. To date enforcement efforts have resulted in approximately 4,000 citations.

Legislatively, the mayor last week signed into law an amendment to the administrative code authorizing the installation of water meters in all new or substantially improved or altered dwellings.

The implementation of this new provision will assist us by providing another tool with which to manage the drought to the maximum extent possible.

Again, Senator Bradley, I want to thank you for this opportunity to appear before you and your committee. I would be happy to answer any questions you may have.

Senator **Bradley**. Thank you very much, Mr. McGough, for your testimony. You have cleared up any doubt that one might have about New York City's position concerning the high-flow skimming project, and I appreciate the clarity and strength of your testimony.

I notice you have a "Save Water" button on. How much have you been able to reduce consumption?

Mr. **McGough**. From the normal July period, the reduction has been 20 percent through conservation efforts.

Senator **Bradley**. What did those conservation efforts consist of specifically?

Mr. **McGough**. Well, a public relations campaign, drought regulations, enforcement, but in the city of New York we must rely primarily upon voluntary efforts, and I think that most of that water savings has to be attributed to the voluntary efforts of our citizens.

Senator **Bradley**. Do you agree with Mr. Marsh that you could improve metering in New York City?

Mr. **McGough**. Yes, sir; we can.

Senator BRADLEY. You've mentioned a 20-percent reduction through conservation efforts. Is that 20 percent of the homes or businesses that are metered?

Mr. McGOUGH. No; 20 percent across the board. Let me explain that only 25 percent of the water used in the city of New York is used by the metered industrial-commercial customers. Fully 75 percent of our water is used by the 2.8 million residences in the city of New York, a residence being an individual apartment or an individual home such as that, so most of the conservation has to come and, I believe, has come from the residential sector.

Senator BRADLEY. Are your conservation figures based upon comparisons with the amount of consumption at a similar time last year?

Mr. McGOUGH. Going back several years. We have an average, a running average that we make a projection on.

Senator BRADLEY. Is the time period selected the month of July?

Mr. McGOUGH. That's correct. That's correct.

Senator BRADLEY. I have here a document from the USGS National Center that as of July 29 the major Delaware River reservoirs were at 55 percent of full capacity. It says that usually the reservoirs are at 90 percent of full capacity at this time of the year.

What does that fact portend for August? Are you going to be able to make that up with conservation measures?

Mr. McGOUGH. I think that—no, it is impossible to make up 40 percent in terms of storage with a 20-percent savings reduction. We have also, of course, supplemented our supply by pumping 100 million gallons of water a day.

But let me point out that since we declared our first stage of drought, which was in February 1985, when we declared a drought warning, we have saved about 34 billion gallons. That is a combination of conservation—that accounts for about 25 billion. Every 5 billion is a single percentage point roughly in the storage of a reservoir. When the reservoirs are full, they contain 550 billion gallons. Every 5.5 billion gallons represents 1 percent of the storage, so 25 billion represents 20, 21 percent. I am sorry, 5 percent, 4 to 5 percent in storage.

Another 17 billion is the result of the good faith negotiations with the other member States, New Jersey, Delaware, Pennsylvania. By following the regimen laid out in those good faith agreements, we have saved another 17 billion, and we have pumped about 1.5 billion since the station was opened on the Hudson River in July—on July 10.

So, all told, about 7 percent, 6 to 7 percent of storage can be accounted for through the drought efforts, so instead of being—we are currently at 53 percent of capacity or thereabouts. We would be at approximately 46 percent if we had not taken those actions.

Senator BRADLEY. Well, that is a very impressive record.

Mr. McGOUGH. It is a good record, but we have to do more.

Senator BRADLEY. How has the price for water in New York changed over the last 10 years?

Mr. McGOUGH. Over the last 10 years it has approximately doubled, all right?

Senator BRADLEY. For both industrial and residential users?

Mr. **McGough**. Yes, we have a flat—we have a rate per gallon that applies to both metered and flat-rated customers. Let me change that.

We have a rate, a single rate for all industrial and commercial customers. The flat-rated customers pay actually on a formula that is called frontage, because a large part of the formula takes into account how much fronts on the street on which the address is determined.

The frontage, the width of the house, the height of the house, the depth of the lot, and the number of facilities in the house, showers, toilets, and so on, each has a dollar value. So it is a calculation, and it is used throughout the Northeast. This calculation called frontage is actually a flat rate amount for the majority of those residential customers.

So there are approximately 85,000 metered customers in the city of New York—I am sorry, 185,000 metered customers, and 650,000 unmetered or frontage accounts.

Now, every apartment building is one of those frontage accounts.

Senator **Bradley**. Of the 185,000, metered units, are they all industrial users?

Mr. **McGough**. Or commercial. That's correct.

Senator **Bradley**. In your prepared statement You mentioned various costs. Your next 10-year plan has budgeted for water infrastructure needs, et cetera; what is the total cost?

Mr. **McGough**. The total over the next 10 years is $3.7 billion.

Senator **Bradley**. $3.7 billion that the city itself has already budgeted?

Mr. **McGough**. That is correct.

Senator **Bradley**. So that is $370 million a year.

Mr. **McGough**. Yes.

Senator **Bradley**. Roughly.

Mr. **McGough**. That is right.

Senator **Bradley**. During the hearing on July 22, we did a catalog of the system needs of New York, New Jersey, Pennsylvania, and Delaware. We asked each State to estimate their needs, and the New York need was conservatively, $6 billion to rebuild the drinking water plants, $3 billion plus for the third tunnel, and $18 billion for rehab and construction of sewers.

Now, are those correct?

Forget the sewers, if that is not in your area.

Mr. **McGough**. Yes, that is also my responsibility. Those are very high.

Senator **Bradley**. So you think total costs would be less?

Mr. **McGough**. Yes; of course, I guess the sewer number includes Federal financing as well, not just local share, but still my recollection of the numbers—and that is over what period, 10 years?

Senator **Bradley**. Just total system needs.

Mr. **McGough**. Well, I guess——

Senator **Bradley**. Let me be candid. The purpose of the question is to see if we can develop a water budget for the Northeast for the long term. Getting input as to what are the system needs from each of the participants is helpful in trying to put together a longer term plan about which we might try to move some Federal support.

Mr. McGough. Well, I would say that the water supply portion if you included building out the high flow skimming project, as indicated in my testimony, you are talking about $6 to $7 billion estimated at this time now just for that project alone. That includes, however, some of the moneys already budgeted in my 10-year plan for the water tunnel.

Senator Bradley. But even under your numbers the city itself doesn't have sufficient revenues to complete these projects. Is that right?

Mr. McGough. I think that sufficient revenues—it has—let me answer it this way. I believe that the city has the wherewithal to raise sufficient funds, and you asked the question of Commissioner Marsh as to why the high-flow skimming project hasn't moved forward.

And I think that part of the answer, additional part of the answer is that, of course, back in 1979, 1978, 1979, the cry through all the Northeast of congressional people and Governors was, you know, we have been spending money in this Nation for projects in the South and in the West, and we need to have some of that money with respect to the Northeast.

And so it was all of us in the Delaware River Basin Commission and so on, our projects that we kept going and petitioning Congress, and of course a lot changed since 1978, with deficits and everything, and people now start talking about no more Federal involvement in water projects just at the time the Northeast needs its share to do its rehabilitation and some expansion.

And I think part of the answer why it didn't move ahead is, we have been as a group here in the Northeast expecting that the Federal Government would begin to fund some of these projects in the Northeast, as we feel rightfully they should, considering, as Commissioner Marsh indicated, the money they have spent in the West and in the South.

So I think that part of it is a regional concern. Obviously if we are coming through and funding everything, then everybody can sit on their hands everywhere else, and as a region, I think the Northeast is going to be shortchanged in this very vital area.

But I want to make it clear that this city is going to do everything it has to to preserve for its citizens an adequate water supply, and should there ever come a point when we determine that we have to go ahead with a project without Federal involvement, we will, if we decide that that is what is necessary to secure a safe drinking water supply, an adequate drinking water supply for the city of New York, just as we have done with the third water tunnel, so——

Senator Bradley. Do you have any idea if you did that what might happen to the price of water?

Mr. McGough. We recently created a water and sewer finance authority in the city of New York to secure our revenue—to allow us to issue revenue bonds in place of general obligation debt supported by the property tax. That water authority is going to separate the city of New York, and with the types of expenditures that are likely to come forward out of a need to further enhance our water supply system, I would predict that we would see water costs go up in the city of New York, yes.

Senator **Bradley**. Do you have any idea what it might be in the next 5 years?

Mr. **McGough**. No. It would depend upon many factors. One of the first things that this board did when it first met was to authorize a rate study in order that we may vary our rates for commercial and industrial customers and also give volume discounts, and also protect the less fortunate of our citizens, because flat or straight rate just means that the rich can use the water and the poor have to save.

So, I can't give you a straight, definitive answer on how the rates might go. We will probably see them go up more for commercial and industrial and maybe stay flat for the low rung of the customer range.

Senator **Bradley**. Well, Mr. McGough, thank you very much for your testimony. Before you go, I would like to just ask you one other question about a slightly different subject, since I have you before me, and that is the North River sewage disposal treatment plant.

As you know, the consent decree says that you have to have preliminary treatment. By what date is that?

Mr. **McGough**. May 1986.

Senator **Bradley**. The EPA keeps us in the region informed of progress of the North River construction, and we are told it is not on schedule. As you might also know, in the recently passed Clean Water Act there are sanctions on New York City if the deadlines are not met. What will be the effect of those sanctions? Do you think that you are going to be able to meet the deadline? What is the status?

Mr. **McGough**. We are going to beat the deadline by 6 months. We are going to turn that plan on in December of 1985, saving us from something that we can't control, and we will have that plant at the preliminary treatment level before May of 1986, but we will begin treatment in December of 1985, and I am assured from the project schedules and CBM charts that I examined that that is doable.

When the EPA notifies its constituents or elected officials of the State of New York and New Jersey about this matter, they go by an overall project chart which envisions completion of various segments of the construction elements. Not all of these elements are necessary to turn on the plant and get it removing pollutants and achieve the preliminary treatment level that is envisioned by the May 1986, date.

Senator **Bradley**. That is good news.

Mr. **McGough**. Yes, indeed, it is, and I want to tell all New Jerseyans that I was educated in New Jersey here along with my father at Rutgers University, and it is always a great thing for me to come back here, and that we in New York City are going to work diligently to clean up our act when it comes to water pollution control.

As you know, we are going to be moving our sludge to the 106-mile site, and we think that there is a lot more for us to talk about positively than be bickering with one another. We have a great region here between our two States, and we would like to see us progress together.

Senator **Bradley**. Mr. McGough, thank you. I agree with you, and I think your testimony today went some direction in proving your sincerity on the issue. Thank you very much.

Mr. **McGough**. Thank you.

Senator **Bradley**. Our next witness will be Dr. David Allee of Cornell University. Dr. Allee.

Dr. Allee, what we will do is try to get the testimony in about 10 to 12 minutes. And I will set up a buzzer here, so that if you hear it, it is not the fire alarm, it is just the first warning on your testimony.

## STATEMENT OF DR. DAVID J. ALLEE, CORNELL UNIVERSITY

Dr. **Allee**. I appreciate that, Senator. My normal speaking style is to talk for 50 minutes and turn around and leave the room.

Senator **Bradley**. I thought that was only Senators that did that.

Dr. **Allee**. No, professors have a tendency along those lines, too.

I am a former director of the Water Resources Research Institute of New York that it is located at Cornell University.

I am currently the chairman of our local government program committee, and I have been working on water problems for the last 20 years.

The last 6 months I have spent in Denver, CO, reviewing a program, I might add a rather unheralded program, for the Bureau of Reclamation, where they work with small projects on a loan basis where local sponsors to do the planning and come to the Bureau for part of the planning.

They are currently running at about 20 percent up front local financing rate and the rest is financed through the Federal Government, part of it being reimbursible, part of it being in grant form. It is a very interesting program, and I think it has more parallels to eastern problems than I ever expected when I first went out to Denver.

I would like to review some of what will be found in that review, and also some of what we have found in some other research that we are doing on eastern water supply problems, largely focusing, as you might expect, in New York State, because this has been predominantly funded by the Cornell Agricultural Experiment Station.

The emphasis, as you might guess, is on the smaller communities and their problems. You have certainly heard from the other end of the spectrum, and perhaps it falls to me to speak a little bit to the problems of the smaller projects in the smaller communities.

I also bring to you the perspective of an institutional economist that was partly trained at Oxford, as you were, and I note with some pride that reformers currently are pushing a lot of the economists' notions, and I would like to give some insights, because I have seen them from that perspective.

The market for water, and every good has some kind of a market whereby supply and demand may be dealt with, whether it is on price or not, the market for water is certainly not like that for private goods, Toothpaste and automobiles are another ball game. The problem of figuring out what the demand for the product is obviously involves a lot more voice.

Supply and demand are a lot less independent, a lot more independent in the case of toothpaste and automobiles. Price is less of an allocator. The bottom line doesn't carry the same weight in connection with decisions that Mr. McGough makes, for example, as opposed to people producing cars.

Yet it can certainly provide more of an allocative role than it has to date. But it will always be a lot less than for toothpaste.

I was impressed at the difference between two parts of Colorado that I had an opportunity to study. I particularly looked at the northeastern area of Colorado in some detail. Colorado established a few years back a water court which allows in the northeastern part of the State rather quick and clean turnaround when you want to find out how much water you can in fact transfer to somebody else's use.

That sounds like it ought to be a fairly simple procedure. It is not. And to my knowledge Colorado is the only State that gives you a really fast and reliable service from that standpoint, and it is done through a court mechanism.

As a result, if you own some water rights, and somebody else wants them, temporarily, permanently, whatever, you can fairly quickly make a deal. The water market in northeastern Colorado in the springtime is frantic. It would please the cockles of any economist's heart.

But you just have to go to southeastern Colorado, where the overall Colorado Conservancy District that services that part of the State, because it takes the posture that private owners should not enjoy the capital gains associated and losses—currently there are losses—associated with owning water rights. They don't allow that kind of reactive market.

As a result, when Fort Collins is looking for water it can turn to the irrigation sector. The irrigation sector is in many ways its banker for water and it can buy as it needs. It can say to the developers, for every acre that you want to put under urban development you have got to bring along 3 acres of water rights, and they specify what date of water rights they are willing to accept, in other words, how secure they are.

In Colorado Springs, it doesn't have that same luxury. If you just look at the prices that people pay for water in a situation like that you can be misled, because people are paying actually less for water that is not provided by the Federal Government than is being provided under the Colorado Council.

For example, it is a subsidized project, yet it is purveying water at a price higher than what locals are paying for their old rights, rights that were developed privately or publicly, well prior to the Colorado Council.

The Federal subsidy is an important issue from your standpoint, but in many ways it is a small part of the game. It certainly needs some fine tuning. The Bureau of Reclamation's main program has spent somewhere around $3.6 billion on irrigation development. It has spent money for other things, too, but this is just the part allocated to irrigation. Forty percent of that will be covered by taxpayers, according to one estimate. This is not my own estimate.

Largely that is covering the interest-free portion of the funding that is involved. Fifty-six point seven percent will be paid through electricity sales. This is electricity that is generated in Federal projects that is sold and then used to pay off part of the irrigation development. The farmers themselves will pay roughly 3.3 percent of the cost.

I am not going to debate whether that is good, bad, or indifferent, but that has been the policy now for several years.

I would like to call attention next to the fact that the Small Reclamation Loan Program which has developed water for roughly 2 percent of the irrigated land down there as compared to 20 percent, 18-something, on the part of the main program operates with a rule that says that there will not be more than a 50-percent subsidy to the irrigation sector. It involves very little of the electricity sales of the project. And as I think I have mentioned earlier, it has been requiring something like 20 percent up front funding from local sponsors.

I think in many ways it rather than the big program is the model that might be looked at. In many ways it may need less fine tuning in order to apply to problems that you can see in the foreseeable future. I say that the Federal subsidy is a small part of the problem in the West because it really affects only a small part of the irrigated acreage. Two-fifths of the irrigated acreage; that is, the growing part, are covered by ground water that is largely privately developed.

Three-fifths is surface water. Of that, the Federal Government has developed about a third. About half of all irrigated acreage, in other words, is surface water where there is much more likelihood that a public entity is involved, and where the Federal bribe in the form of a subsidy of some sort is available to achieve things that need to be achieved.

Of course, part of this is getting the water into uses that have a higher value than current uses. Where farmers are concerned about this, this is what they turn to when they talk about the market model, and that is why they feel the need. Those other uses are in many cases apt to be in another irrigated acre. In other words, there isn't an urban use.

Besides urban uses and another irrigated acre, you also have the fish and wildlife acres that are clamoring for more water and bring to the table much less capacity to pay for the water. Whether that should be paid for from Federal sources or not is something that needs to be debated.

Now, how do you get these improved efficiencies? One possibility is to raise the price on the Federal water. That is going to be limited not only because it is a small part of all water that is involved out there, but also because in many cases you are just simply going to end up losing Federal customers. They have alternatives. What puts the limit on what the Feds can charge for water now is often what it costs to pump it.

Now, recognize that pumping ground water also doesn't reflect the social opportunity losses that are involved. That is water that the neighbor is going to use if they don't, you know, and that sort of thing. So, often controlling ground water is properly the next major step.

Now, you might turn to pressuring the States for major institutional changes, and you can do a lot of that through improved information, and certainly the universities have probably contributed through funding from the Federal Government to the debates out there. You can also try to tie mandates to the Federal funds that you do provide.

And the central Arizona project is sometimes touted as having had an impact on Arizona's ground water loss, a very innovative piece of legislation, a model for much of the rest of the West; for the East, too, for that matter.

However, if you look at the case in Arizona, you have to, I think, agree that it was the pressures working under a rather archaic State court developed ground water law that really produced the changes, and certainly the Federal mandate helped, but it was not, I think, the deciding factor. If Federal mandates associated with Federal funds are ever going to work, they would have worked in central Arizona in that situation.

We will have more of them in the future rather than less, but still I think the major opportunity comes from a little more subtle use of the Federal bribe, a little more use of bargaining between the interests that are involved where the Federal agencies are charged by you and your colleagues to essentially stand for more of a modern conservation agenda.

The consolidation needs to take place between the many small purveyors of water and the efficiencies that can be had. The whole question of conservation which is intimately tied to the problem of water quality maintenance, the whole question of combining flood control with development, a lot of efficiencies and gains to be had there.

The opportunities for fishery development in the West associated with irrigation rehabilitation are substantial, and getting some kind of communication and dialog going between the fishery industry and the irrigation industry that now tend to throw bricks and not listen to each other is an important opportunity.

And, of course, the whole traditional question of equity, who should pay. Should the irrigator pay? Does it depend whether he drives a Cadillac or is not too sure whether he is going to be able to register the pickup truck? There are communities of farmers that differ in that respect, and right now we don't take that into account when we are figuring out the bribe level.

I am essentially advocating that we trade money for better management, because I think in our political system it's the most effective way. The Eastern potential to achieve equitable water rights is much less in the short run. The parity doctrine lends itself to an affirmative procedure. Most of the States have a permitting process that is moving toward the appropriate arrangement that we have in the West, but we are still a ways from having a market in State permits in the East.

We certainly have situations where a new user compensates an old user to let him in on the supply, and that is an important part of what some of that market does, but compensation for transfers are still basically—basically occur in the larger political arena. The haves and have-nots in northern New Jersey are probably going to come up with a more efficient and equitable system only when we figure out a way to bribe them into the same list of things I talked about before, conservation.

Leak detection is probably one of our best investments in terms of conservation. Most municipal systems in the Northeast—I say a number, not the large ones, but the smaller ones probably have leakage rates in the 50-percent range. That is a lot of waste. Some local officials would just as soon not know about that.

The lawyers see it is easy, it is somebody else's problem. I won't be here when that really gets bad.

Technical assistance, in other words, that reinforces some of the existing arrangements is suggested. Consolidation and cooperation between municipal units, it is rare that you are going to get very many to completely consolidate, in other words, where a new entity or an old entity will completely take over the water functions of an old entity.

Rather, you have things like an authority coming in and providing wholesaling of water where the existing entities do the retailing, and the important thing in recognizing the difference in this kind of a market continue to represent the demand discovery side of their clientele, but you have got lots of opportunities where a few Federal dollars could stimulate movements toward more efficiency.

For intance, the idea of a circuit-riding manager between a number of local units. It is a simple step. It is one that local officials find difficult to do, because after all it is probably their cousin that is running the existing system, and is he really ready to retire yet? Bringing that system around to seeing that is something that you can probably achieve through more effective public bribes.

Water quality management. The role for local purveyors of water supply in the Northeast to get involved particularly in terms of toxics management, is, I think, very real. Before we discovered chlorine, we had something we called the sanitary survey, where a water purveyor was expected to check out his source of water and what outhouses and dead dogs there might be lying around that threatened its quality.

Now, today we are not talking about outhouses and dead dogs. We have pretty well abandoned those kinds of problems. But when it comes to the literally hundreds of different kinds of toxic chemicals that are ubiquitous in the landscape—they are sort of in every commercial building and many homes have them—how are you going to control that?

I have suggested the present Federal and State programs for toxic control are a long way from meeting all the needs, and they are never going to meet all the needs. It is going to come down, I think, to the water purveyors to fill the gap, and they are not going to go into that very easily or very quickly.

A Federal program that helped them get there, it may not make a whole lot of political sense where it is far enough along, but I will be back in 5 years to check.

Flood control. Changing the operating rules on existing flood control sectors are probably the cheapest source of water supply in the Northeast today. To significantly change those operating rules, you are going to have to compensate in some way those who have been receiving flood protection from those facilities. That will not be a simple step politically.

Again, I would suggest that the kind of multiple purpose planning that the Corps of Engineers is good at, for example, is just going to have to be gone through again and again and again in order to hammer out the kinds of compensation that people are going to find acceptable.

Habitat improvement and protection. We may not have quite the same thing as the irrigators cussing the fish and wildlife people that you have out West, but we are not that very far from some innovative approaches in dealing with habitat improvement problems I think are very much called for.

Those can reasonably be hooked to water supply projects in some cases, and again we have the problem of equity and ability to pay. It may not be worrying about the irrigator and whether or not he has got a pickup truck or a Cadillac, but we certainly have communities in the Northeast with limited ability to pay, and others who have plenty of money. Structuring our Federal influence so we can recognize that is a challenge.

Let me end that list with one that I did not detect to the same degree in the West as we needed here in the East, and that is an emphasis on maintenance. The so-called infrastructure problem, as near as we can figure it, is very much, at least in terms of medium- and small-sized systems, a question of deferred maintenance.

It is an easy thing to put off, fixing the water system, when you have got constituents clamoring for other kinds of services, and you are in the kind of financial crunch that local governments have been in for the last half dozen years.

Putting more emphasis on cost sharing and achieving that maintenance cost sharing and experimenting with cost sharing may be what is called for. In this regard New York may have an analog that leads the way. New York has been cost sharing maintenance and operation for sewage systems now for some while. Remember that when you look at a local government and it is not doing what it ought to do, remember that that local government is a creature of the State in which it operates, so if it is not achieving what it ought to achieve, I am sure you can hold the State partially responsible for it, but in a sense you have to treat them as a package.

So if you are trying to think about how the Federal role fits in, and you see things that aren't getting done, threat that as a package.

Well, New York has addressed this question. An emphasis on capital grants, I think, runs the risk of overdesign, which has been well documented by some of your colleagues. An emphasis on maintenance cost sharing may indeed make more sense, and also a deemphasis on capital grants may energize some of the local ability to control costs.

This is one of the things that impressed me on the SRPA Program of the Bureau of Reclamation. Those are local projects that feel like they are local projects. Even though the Federal Government may be putting up a substantial amount of money, they consider them theirs, and are putting in enough of your own so that they are very careful about the nickels and dimes and dollars and cents.

And they resist notions that the Bureau may have in terms of goldplating the facilities for one reason or another. The Bureau has learned to make that program go. They have to supervise it only to keep themselves from becoming embarrassed, and that is a far cry from the way they would design projects if they designed them themselves.

In conclusion, let me say I think the Western and Eastern needs are much more in line. They both need Federal stimulation to do things that they can't or won't do themselves. They need more emphasis on building management capacity, and that includes things like pricing and conservation, and less emphasis in the Federal role on subsidizing large capital items.

I suggest that this means that we should be looking at EPA type program cost sharing by State and regional agencies with emphasis on information and identifying the self-interests of more of the publics out there, more bargaining to help things get reorganized, and then finally the limited capital grants that we do go with.

I suggest the Small Reclamation Project Act model is probably more useful than some of the others that we have, using to the full the local repayment capacity and cost control capability. They have a very interesting approach to trying to estimate what the repayment capacity is.

Of course, it works easier for irrigators than it does from municipalities, but the limited capital grants, I think, should be thought of not so much as fair shares, and the West got their fair share before, and now it is our turn. I think we need to be more sophisticated about this than that. It isn't just a question of fair shares. It is what is it the Federal Government is going to get for its money.

[The prepared statement of Dr. Allee follows.]

## Federal Programs to Improve Water Supply Allocation

This statement is based on a research project at the Cornell University Agricultural Experiment Station. Two reviews are in progress -- one for the East and one for the West. The eastern study is based on several samples of relatively small municipal water systems. The western phase has been examining a series of projects under the Bureau of Reclamation Small Loan Program. A pattern is emerging which suggests that the needed changes in the federal role are more alike in the East and the West than different.

### Every Market Can be Made More Efficient

Every good has some way in which demand is discovered and supply is provided: in other words, it has a market. The market for water is greatly different than that for private goods such as toothpaste or automobiles. The demand process involves more use of the voice, rather than the feet. Supply control and demand discovery are carried out by public officials and are less independent. Price and certainly the bottom line is used less as an indicator of where supply should go. The reformers in recent years have advocated greater use of a price-directed market to increase efficiency of water supply. In practical terms, this means public programs that work differently. Comparison of the conservancy districts in Northeast and Southeast Colorado is instructive. In northeastern Colorado, the water courts, a relatively recent state innovation, can quickly tell you how much water you can actually turn over to a prospective user of your rights. Downstream interests are thus protected, and sales and leases can be consummated quickly and reliably. Supplemental water from a federal project sells for more than the water that was already available. But expanded urban use and increasing groundwater pumping costs have produced a lively market. Note that the annual prices paid for the water give little or no indication of this market. Instead, it is the transfers between users, between ditch companies and between districts, that represent the real market. It's not the price, but the opportunity cost, and those with the higher value opportunity have ready access to water.

In southeastern Colorado, the situation is quite different. It is reported that the conservancy district there has a policy of not allowing the individual user to enjoy the capital gains (and losses) associated with water rights. In effect, irrigators can transfer water to other users only with the approval of their fellow irrigators. The result is a substantial diminution in the access of new users to existing supplies.

Fort Collins in the northeast region has reconstructed an old irrigation reservoir, leases the water that it will eventually need to irrigators and had this arrangement facilitated under the Bureau of Reclamation Small Loan Program. Another step the city has taken is to require the transfer of three acre-feet for each new acre proposed for development. Developers are able to do this because of the active water rights market.

The situation in northeastern Colorado is unique, but points the direction in which many western states are probably headed. Even in Colorado Springs, the situation is not as flexible. But as the pressures, i.e. the opportunity costs, increase, more western water management regions will be turning to such arrangements.

Federal subsidies for water development have provided only part of the potential. The Bureau of Reclamation's main program has spent $3.6 billion for irrigation development. One estimate is that taxpayers will cover 40 percent of this. Electricity sales will pay for 56.7 percent, and farmers will repay 3.3 percent. This is under federal projects and is a distinctly different picture from that of the small reclamation loan program where currently the federal subsidy is limited to 50 percent, except for Indian projects, and where electricity sales are a minor factor in financing.

The main Bureau of Reclamation program provides some water to approximately 1/5 of the irrigated land in the West, or roughly 10 million acres. For about half of this it provides the sole supply. It should be recognized that groundwater now provides 2/5 of the acreage, has been growing rapidly and is largely privately developed. This leaves 3/5 from surface water supplies, and a quarter of that is private diversions. Thus, about a third of the surface water is developed by federal projects, and something less than a half of the surface water is developed by public nonfederal projects. Most of these are local districts and mutual water companies. The majority utilize installations constructed many years ago. Many of these facilities are obsolete and wasteful by today's standards. Their redevelopment offers an opportunity for more effective allocation of water to higher valued uses. In addition to urban use, water released through greater efficiencies or by compensating the former user would go in many cases to another irrigated acre that today receives less water than it can efficiently use.

Another important potentially higher valued use is for the improvement of fish and wildlife habitat. However, the prospects for local sponsors to pay for development and compensation in the name of wildlife is minimal at best. State and federal agencies will have to rethink their financial arrangements for habitat development.

## How to Get These Efficiencies in the West

Raising the price on federal water has been repeatedly proposed and vigorously opposed. Where it can be effected, it may be of limited help in the short run. Federally provided water is often more expensive in terms of annual cost than the local water it supplements. In more than a few cases groundwater pumping costs set a short run limit on what irrigators are willing to pay for additional supplies. And note that in most states it is less likely that groundwater can be transferred to new users than serface water.

Pressuring states for institutional changes has only a modest potential. More research, information, education and technical assistance is probably the most effective approach. Mandates tied to funds are given some credit in Arizona for the adoption of their pioneering groundwater law. But the main pressure was from frustrated new users in the archaic groundwater law developed by the courts. It is possible that bargaining for changes at the small project level and facilitating incremental shifts in management capacity may have more potential. There are only a few federal Arizona project type negotiations left.

The Small Reclamation Project Act of 1957 provides funds for locally planned and executed water projects. They provide the fiscal flexibility and an inter-interest bargaining context that stimulates a number of desirable results. With more explicit direction and authority, from the Congress, these results could be improved.

A number of projects have brought about the consolidation of cooperative management of water resources between a number of otherwise independent providers. For example, a combination of municipalities and mutual water companies may join together in the development of a common storage facility. This is often done without the loss of representation of local interests.

Conservation through canal mining, underground distribution, more efficient facilities and capacity to allow deliveries to the individual irrigator that match needs as well as onfarm improvements have been facilitated. Just as in the case of consolidation there are no explicit incentives in the financing arrangements under the SRPA program for conservation, and if there were some, it might be more effective.

Some 25 to 35 percent of the irrigated acreage in the West faces a water quality problem from excessive salts. Through conservation measures, more and more irrigators are finding it economic to only apply enough water to provide planned needs and reduce losses to groundwater and runoff to practically nothing. As the price of water continues to rise, more and more will be adopting these measures. Federal and other funding will help. But there will still remain the need to flush salts out on this 25 to 35 percent. Those salts and associated pesticides, naturally occurring heavy metal contaminants, etc., have to go somewhere. Appropriate disposal sites have only been provided in a small number of cases.

The need for new funding arrangements for fisheries and other habitat improvements has been noted, but these opportunities are important enough that they should be added to the list here.

Flood control is traditionally subsidized by the Federal Government, and for very good reason. The ability of local jurisdictions to collect from flood control beneficiaries is limited. If people perceived the flood control risk that they face accurately, there would be less need to provide protection. And that perception deficiency not only leads to the problem but also to an unwillingness to pay for its solution. Flood control is often cheaper to provide in conjunction with a water supply project and the federal subsidy can and should be used to strengthen the ability of local officials to prevent future flood damages.

Irrigation is currently subsidized by providing interest-free investment funds. Several suggestions are currently being reviewed to reduce inconsistencies with the price support programs and to require minimum levels of up-front cost sharing. It is also suggested that means tests be introduced at the farm and/or community level.

The East is More Alike than Different

Eastern potential for vendable water rights is much less than in the West. While the riparian doctrine and particularly its reasonable use variant allows the states to introduce permit systems, and these permits are taking on the characteristics of property rights, we are still some way off from buying and selling these rights. We do have some cases where a new user will compensate an old user to allow access to a water supply. And this may be increasing. However, compensation between "have" communities and "have not" communities is still largely in the broader political arena.

The potential for consolidation and cooperation in the East is quite as important as it is in the West. Again, it is rare that a new or an old entity takes over all of the functions from an old entity. More common are the regional authorities who provide wholesale services to the retailers who represent the constituents. Potential exists for much greater cooperation. This can be seen in particular if we examine the opportunities for such innovations as circuit-riding managers and other shared services.

Conservation is again a question of improving facilities. Leaked detection services are welcomed by some communities, but others appear to not want to know their problems. The opportunities for education and technical assistance, particularly if associated with modest cost sharing, are substantial.

Water supply entities have a role to play in water quality management. A modern version of the sanitary survey is needed to protect the water sources that are now used for drinking. Toxics management cannot be left to only state and federal programs, nor only to the treatment of liquid and solid wastes. The potential for spills is so ubiquitous that water supply organizations need to get into the act.

Habitat improvements and protection offer as much potential in the East as in the West in terms of joint economies with water supply management. While there may not be the history of antagonism between water suppliers and wildlife managers that exists in the West, it is still significant. The need for a new approach to planning and financing is almost as great.

Flood control and its opportunities are similar in the East and the West. Storage projects, in particular, offer joint benefits: indeed, flood control structures may be the cheapest source of water supply in the East. Changing them to water supply use will require compensatory action for those who have enjoyed flood protection.

Again, the equity considerations of those who would receive the water supplies are an important issue. Rather than an irrigator and his or her community passing a means test, we have a history through the Farmers Home Administration of applying a means test to the householder and his or her community. Just as in the case of the irrigator, we expect to use the full local ability to pay.

If there is a difference in emphasis, it should be on maintenance. The so-called infrastructure problem seems to be largely one of deferred maintenance. The federal emphasis on capital grants may run the risk of overdesign and undercontrol of costs. A new approach to maintenance cost sharing that reinforces a program of technical assistance should be considered.

The problem of maintenance has been more thoroughly documented in the case of sewer facilities. New York State may have lead the way in its program for state cost sharing of maintenance and operation.

## In Conclusion

Several tentative conclusions can be stated at this time. First, western and eastern needs are more alike than different. The eastern and western interests should be seeking a coalition on their common concerns. Second, in both the East and the West there is a need for federal stimulation to get local and state managers to do the things that they can't or won't do themselves. Third, more emphasis should be placed on building management capacity and less emphasis on subsidizing large capital expenditures. This implies an EPA type program that cost shares for state and regional agencies. More information is needed to help communities identify their self-interests. More bargaining is needed to help get water supply reorganized. Fourth, limited capital grants should be contingent on the use of local repayment capacity and cost control capabilities. Grants should be pointed at what locals can't do. Experimentation to reinforce good maintenance practices is needed.

Senator **Bradley**. Thank you very much, Dr. Allee. You have given us a great deal to think about.

Do you think we are better off with more actors in the game or fewer actors? For example, we are a region, or at least in the State of New Jersey we have many, many, many separate water supply companies, both private and public.

If you are looking at it from the market standpoint, the more actors you have, the better, but that presumes certain things, such as the ability to get the commodity in question from one place to another, which implies interconnections. It implies a variety of other things.

So, my first question is: Are we better off with a great number of actors, or are we better off with a consolidation, fewer actors, and a better flow of information among those few larger actors?

Dr. **Allee**. I would make a distinction. I think I would divide actors in terms of their role on the demand side and their role on the supply side. There are significant economies on the supply side. You have indicated a number of them, the advantages of interconnections, and so on, the whole set of functions.

On the demand side, I suspect that we do a better job of discovering the demand, what the public would want in the way of local services in smaller units. Now, this will continue to add to some of the confusion and chaos that we have in water supply if we have a lot of people representing constituents on the demand side to some kind of a regional purveyor, but I think the name of the game in a democracy is a touch of confusion anyway, and it is a small price to pay for people to feel like they have some control of their destiny.

Let's put it another way. If you don't give them that role, they probably won't put up with the consolidation on the supply side.

Senator **Bradley**. You have this long list of things that we at the Federal level have to be sensitive to—flood control, habitat protection, and the relationship of toxics to cost in the local water systems, et cetera.

Do we have to address each of these issues sequentially, individually, or is there some way that you can address them at the same time?

Dr. **Allee**. Well, awareness, given the problems that you have to deal with, the things that people would have to be motivated to deal with, it has to be on the agenda, but certainly getting a number of these on the agenda has some advantages. Many of them are cheaper to treat when you treat them simultaneously than sequentially. That is the game. That is the opportunity.

Getting the institutional capacity to actually get all of those items on the agenda at one time is a tough trick. Somebody like the Delaware River Basin Commission, for example, has been working away at that task for a long time with only limited success, so I am not suggesting it is easy.

Senator **Bradley**. So when you say that what the Federal Government needs to do is stimulate local and State managers to do things that they can't or won't do themselves, is this some vague hope?

Dr. **Allee**. No, I think reality says you are going to get a few of those chances at a time. In other words, only a few of them will be on the agenda at an agency, like the Corps of Engineers coming in with a part of the funding package can probably bargain to get one or two more on the agenda than otherwise.

I would suggest, for example, that a local water supply agency that goes to the corps for a joint project expects to deal with flood control and expects to deal with fish and wildlife habitat values. That is expected. When you don't have them coming to the corps, they are going to ignore both of those things.

Now, whether the corps can now get them to take on more consolidation is going to depend in part on the kinds of words that you give, you put in the marching orders to the corps. Your colleague, my Senator, Moynihan has put language, for example, in the last omnibus bill—it was taken out as a result of bargaining on the supplemental appropriation—to give the corps an authority similar to the SRPA Program that the Bureau has in the West. Tailoring those works so that they emphasize what I would think other people would want as an important part of a modern conservation agenda, I think, is an important part of the marching orders that they have.

Senator BRADLEY. Well, if your figures are right, 50 percent leakage seems rather high?

Dr. ALLEE. Those are not my figures, but I certainly can share them with you.

Senator BRADLEY. I would like you to provide that for the record. I would like to see if that can be verified, because if it can, that is a startling figure.

Dr. ALLEE. We did a survey of key informants who work with local water supply systems in New York State, and I gave you the average response from those key informants, and then there is literature on the extent of leakage which I can summarize for you.

Senator BRADLEY. Thank you very much, Dr. Allee. I hope you will provide those for the record.

Dr. ALLEE. I will provide a revised copy of the written testimony that I gave earlier.[1]

Senator BRADLEY. Thank you very much.

Our next witness will be a panel of Dr. J.L. Buzzi on behalf of the New Jersey Alliance for Action, and Ms. Alex Cukan of the Sierra Club. Is Ms. Cukan here?

[No response.]

Senator BRADLEY. Mr. Buzzi, you may go ahead. We are short on time, so we are going to try to keep to 10 minutes, and then split it between your presentation and questions and answers.

## STATEMENT OF DR. JOHN L. BUZZI, DIRECTOR AND FOUNDING MEMBER, NEW JERSEY ALLIANCE FOR ACTION

Dr. BUZZI. Thank you, Mr. Chairman and members of the committee.

I am John L. Buzzi, a director and founding member of the New Jersey Alliance for Action, whose membership represents a broad spectrum of the State's business, labor, and governmental and professional leadership.

---

[1] The information was not received to be incorporated in the printed record.

Since its birth in 1974, the alliance has been committed to improving the quality of life for all the people of New Jersey through economic expansion, the creation of jobs, and the elimination of unnecessary bureaucratic red tape that impedes progress in achieving these goals.

In recent years the State of New Jersey has witnessed a series of events. We have experienced almost constant annual water shortages, both ground water and surface flows, in the Delaware River Basin, New Jersey, and the New York City metropolitan areas. We have learned to take our dirty cars, browned out lawns, and increased use of cologne in stride as a measure of our quality of life.

Let's take a look at the past. In 1980, the New Jersey Alliance for Action and other associations throughout the State were instrumental in forming the Natural Resources Citizens Advisory Committee, which provides oversight and advice to the Department of Environmental Protection on the implementation of programs funded through bond issues.

This committee had input into the final draft of the water supply master plan which was issued in final draft form just prior to the voters approving the 1981 water supply bond issue, which provided $350 million to ensure New Jersey of an adequate water supply.

In 1981, the good faith agreement was entered into by the four Delaware River States and New York City. However, this document places major emphasis on managing droughts, unfortunately with minor emphasis on managing water resource planning through the year 2000.

The Tocks Island, it is mentioned—the Tocks Island project on the Delaware River is to be held in reserve status to meet needs beyond the year 2000.

In the fall of 1983, the New Jersey Alliance for Action participated in the State's Water Resources Management Task Force to address the water infrastructure financing dilemma, which I will address a little later on.

In 1984, the U.S. Corps of Engineers issued their report entitled New York metropolitan area water supply study, which made recommendations concerning both ground water and surface supply problems. Presently the New Jersey legislation and administration have been debating a 10-bill legislative package known as the Environmental Trust Fund to finance resource recovery, solid waste disposal facilities, waste water treatment facilities, sanitary landfill closures, and the cleanup of hazardous discharge sites in order to protect our environment.

Recently, the Natural Resources Citizens Advisory Committee, in its oversight role, found that the New Jersey Department of Environmental Protection has been moving forward responsibly on the implementation of the water supply master plan and the spending of the $350 million Water Supply Bond Act bonds.

Certainly with all this activity one must wonder, why are there water resource management problems in our Middle Atlantic States? What is being done now? What can be done in the future?

The New Jersey Department of Environmental Protection has updated its Water Supply Master Plan and found that it could eliminate the Raritan-Passaic pipeline to carry water from Raritan basin to northeast New Jersey and hopefully apply those moneys to other needed water supply projects.

The system interconnections have been made in order to provide a more reliable water distribution system. The New Jersey Water Supply Authority created in 1980 has assumed operation of the Round Valley-Spruce Run system, and is presently completing a project to dredge the Delaware and Raritan Canal and has completed engineering feasibility studies and is presently engaged in a fast track design and preparation of an environmental impact statement for the Manasquan Reservoir system in Monmouth County.

Unfortunately, these projects take time. It has taken 30 years of hard, dedicated work by the North Jersey District Water Supply Commission to provide an expansion to the northeastern New Jersey water supply system, including pumping stations, force mains, interconnections, storage reservoirs, and its current Wanaque South project, which they are doing in cooperation with Hackensack Water Co.

We do not come here today to offer the panacea to provide an adequate water supply for a State or region. However, we do provide a triad of finite suggestions to facilitate the planning, financing, and implemetation of water projects.

One, as part of a legislative package defining new directions for national water policy and programs, establish a national water resource management center and locate it at the New Jersey Institute of Technology. The country lacks a national generic water policy to guide the States with their programs and projects.

The State's Water Resource Management Task Force recommended the establishment of this national water resource management center at NJIT in Newark. The center would bridge together the professional talents to address the objectives of quantifying the true economic value of water to users, defining the basic requirements of management structure and capital financing for water supply systems, establishing a base for determining actual cost of providing water service, and comparing it to prices currently being charged the users and measuring public attitudes on water supply needs and policies.

We ask that the New Jersey Senators and House delegation take a leadership role, along with their colleagues in the middle Atlantic States, to implement a national generic water policy and to recommend that the New Jersey Institute of Technology be designated as a water resource management center site as an amendment to Senate bill S. 904, entitled Water Research Foundation Act of 1985, as sponsored by Senators DeConcini, Durenberger, and others.

A more detailed description of this center has been submitted to your subcommittee for inclusion in its hearing record today by NJIT.

Second, establish a truth in funding mechanism to fully advise the public as to the total cost of providing public services in the area of waste water, waste disposal, and water supply. Over the years, the Alliance for Action has noticed that it has taken an overabundant amount of debate in order to provide adequate funding legislation to provide essential public services in the form of waste water, waste disposal, and water supply infrastructure projects and programs.

There are many actors involved, including private sector developers, legislators, agencies, authorities, commissions, other public and private entities, financial institutions, consultants, and finally the taxpayer.

There are many elements of cost to consider, such as ad valorem taxes, property taxes, sales taxes, interest subsidies, tariffs, user fees, direct charges, tax deductions, tax-free bonds, investment tax credits, accelerated depreciation, and other indirect charges.

There are competing financial methods, including loans, bonds, notes, mortgages, dedicated funds, grants, venture capital, as well as the newest financing buzz words, privatization and infrastructure bank.

Since the bottom line is that the taxpayer pays for every element of cost, we make this proposal for truth in funding. Every legislation or program dealing with providing essential public services as defined above should provide full disclosure of the distribution of the cost to the taxpayer.

For example, each dollar of funded waste water facilities in New Jersey is paid for or was paid for with 17 cents in user fees, 8 cents in State grants, taxes, and 75 cents in Federal grants taxes.

The taxpayer indeed pays 100 cents. Unfortunately, if we account for the regional distribution or redistribution of funds, which is the fact that we must pay almost $1.50 to get $1 of grants in New Jersey, we see that the New Jersey taxpayer really pays $1.42 on the dollar, discounting operating costs.

A taxpayer receiving a user fee of $570 for the debt service portion of his sewer bill is actually paying almost $1,400 for this essential public service.

In like fashion, in a facility that is funded using privatization, the taxpayer will know that the elements of his costs are quantified in terms of investment tax credits, loss of tax revenues, accelerated depreciation, schedules, loss of tax revenues, and interest subsidies, loss of tax revenues through the use of industrial development bonds as well as user fees.

Infrastructure bank financing also results in like costs to the public through use of grants, dedicated taxes, and other like means to fund the bank as well as the cost of interest subsidies.

Of course, there will be an outcry that this can't be done. However, we see it done all the time. Our refrigerators and air conditioners contain energy efficiency ratings. They tell us how much it costs to operate our appliances.

EPA uses estimated miles per gallon posted conspicuously on the sticker price, next to the actual purchase price of our automobile, and tells the consumer how much it costs to own and operate his automobile. Throughout the Nation you can drive behind tractor trailers upon which is emblazoned a sign informing the public just how much the trucker pays in road user fees on an annual basis.

A bank loan contains a truth-in-lending disclosure statement which informs the purchaser of the total capital and interest costs they have to pay on the borrowed amount. Thus, this truth-in-funding law would provide a full disclosure of the costs and keep both the public and political focus on financing essential services rather than political rhetoric as to who "gave us the funding.'

Item Three: Create a one-stop permit at the Federal level similar to and coordinated with our State program to bridge the gap between the needs of the implementing agencies and the requirements of the various regulatory jurisdictions.

Several years ago, at the urging of the New Jersey Alliance for Action and others, the Citizen Committee on Permit Coordination was formed to work—I am on my last page—with the New Jersey Cabinet Committee on permit coordination in order to bridge the gap between the needs of the construction industry and the requirement of the various State regulatory jurisdictions.

Under this program, an annual directory of State programs for regulating construction is prepared. Anyone who desires to construct a facility may complete an NJDEP master permit information application. Upon review, the applicant is noticed specifically if those permits are required, and in conjunction with the 90-review law is assured that the DEP will process certain permit applications in a timely fashion.

We, therefore, propose that such a program be established for Federal programs that regulate construction, similar to and coordinated with our State program, in order to facilitate the planning, design, construction, and implementation of these essential public service facilities.

Once again, we thank you for providing us with the opportunity to provide this testimony.

Senator BRADLEY. Thank you very much, Dr. Buzzi.

I think you have offered us some food for thought. The truth in funding law is a very interesting concept. We will go to work on that after a unified budget and full accounting for tax expenditures and a variety of other things that I think are all meritorious.

I think that your three recommendations will be carefully considered by the committee, your testimony has been helpful.

I have only one question for you, and that is, if you want the Federal Government to support water projects, what level of cost sharing would you suggest for State and local government?

Dr. BUZZI. I think cost is not the issue. I think doing it, getting something done that the public can trust in is the issue. The cost of collecting trash in 10 years has gone from $2 to $3 a ton to $10 to $15 a ton, and it is going to be $20 to $30 a ton very shortly.

If some of these tax reforms that we hear about go into effect, privatized trash disposal facilities might add another $10 to $15 a ton onto those prices. So the public is going to pay whatever it has to pay to get a clean environment.

I think what we are saying is, maybe we can cut down on the rhetoric and tell the public exactly what these facilities cost. It is not that user bill that you get at home for a small, municipally owned system might be so heavily subsidized in the ad valorem tax some place that the cost is lost.

It is not the sewer user who gets that $170 bill. He has got to understand he has paid for those rates. So I think our point is, if we can have a comprehensive policy whereby the State can implement their programs and projects, that the moneys will fall out, and 90 percent of the public is concerned about the environment. The public will pay what it takes in order to get clean, potable water.

Senator **Bradley**. So your point is, it doesn't make any difference to you whether it is Federal, State, or local funding.

Dr. **Buzzi**. Absolutely not. We are just looking to get projects moving, needed projects.

Senator **Bradley**. OK. Thank you very much, Dr. Buzzi, for your testimony.

Our next panel will consist of Mr. Rocco Ricci of the New Jersey Water Supply Authority, Mr. Richard Tompkins of Middlesex Water Co., and Mr. Robert Gerber, of the Hackensack Water Co.

Gentlemen, welcome to the committee.

If you can, I would like you to try to or present your testimony in 10 minutes each, if you could, so that we can have a full hearing and get to some questions and answers.

Welcome to the committee, and as those who are on the front line in the water crisis, the crisis being the day-to-day provision of quality water at a reasonable price, I welcome your perspective for the committee record.

## STATEMENT OF ROCCO D. RICCI, EXECUTIVE DIRECTOR, NEW JERSEY WATER SUPPLY AUTHORITY

Mr. **Ricci**. Thank you, Senator.

I welcome the opportunity to appear before your committee. I am Rocco Ricci, the executive director of the New Jersey Water Supply Authority.

Over the past 20 years we have experienced a number of droughts in New Jersey and also in California particularly, and it appears to me that this should provide ample evidence of the economic value of adequate water supplies in this country.

New Jersey's droughts of the sixties and the eighties—two in the eighties, as a matter of fact—as well as the failure of the Trenton system in 1975, can provide valuable information about the potential economic impacts of inadequate water supplies for emergencies as a result of failure of such supplies.

Now, these impacts, economic in nature, affect industrial and commercial activities as well as the paychecks of the people working for these organizations. There are great costs associated with government in its responses to these emergencies.

In addition to that, we have to recognize the importance of adequate and well-maintained water supplies for the general health and safety of our modern society, not the least of which, its role in economic development for the future of this State as well as the rest of the country.

As a direct result of the 1980-1981 drought, New Jersey initiated a number of programs to begin to address these deficiencies in the State's water supply systems.

Included, of course, and you heard some reference to it in previous testimony in the hearing, deals with the development of new supplies, building new reservoirs, interconnections, diversions, not the least of which a major effort to begin to address some of the deficiencies in the whole infrastructure of the State.

I guess unlike one of the previous speakers, with reference to only small systems, I think the problem is quite epidemic in the larger systems as well. As a matter of fact, it is one we would be really speculating as to how much water you could save by tightening up the systems. There have been various estimates, but it certainly is a ready source of new developed water at a relatively expensive price.

I would say, however, it is less than the cost of building new reservoirs. Now, all of the State efforts have the support of a $350 million bond issue, which the State passed in 1981.

Throughout the United States there has been a growing awareness of the decay of the Nation's infrastructure. We see examples of collapse of bridges, not the least of which is the Patton Bridge, which you are well aware of at the present time, the failure of sewers, and frequent failures in water supply systems, particularly water main breaks.

Generally we find these in the larger, older urban centers. They certainly give ample evidence of the critical nature of the problem. Over the years, many of our water supply systems have suffered from the lack of attention to maintenance, systematic rehabilitation and replacement, and other capital improvements which are necessary to provide continuing reliable and effective water supplies.

I think certainly it does little good to look at the exploration of the pieces to understand how we allowed this to happen, but there are many pieces. However, we now must get on with the job of establishing the compelling need for professionals in the field as well as the general public, to really understand what is necessary to cope with this serious problem, and to determine just what is required to correct the existing water supply deficiencies, not the least of which is to properly operate and maintain the systems in the years ahead and to provide for the orderly and realistic financing of these vital services.

There is a need for recognition of the importance of providing New Jersey and the Nation with water supplies based upon this realistic planning and public understanding of the value of water in our society, which is not there, and the establishment of effective management practices for the water utilities, I dare say both the public and private as well, and also the development, and this certainly should be in there, the development of adequate pricing for water supplies, so that we can support planning, the planned rehabilitation, and the improvements in the years ahead.

Dr. Buzzi made reference to the fact of the water resource management center. I would like to dwell on that a little bit and give you a little bit of detail if I might. This recommendation came out of a series of meetings of a committee of which I was a member comprised of representatives of industry, government, the general public, the water utility industry, and also the educational institutions, and indeed they did recommend the creation of a water resource management center at the New Jersey Institute of Technology.

This center would provide the basis for demonstrating the effectiveness and efficiency of a State, Federal, and local partnership in addressing some of these issues which I have just briefly mentioned previously.

A keystone of this effort, though, a very important keystone, is the development of a heightened public awareness and recognition of the various interests in an adequate water supply in all aspects of our modern society. The creation of the center would provide a professional center to carry out various water resource programs, including such things as the establishment of a data center for more effective analysis of water resource issues and needs, and develop and implement an educational program to provide the required professional people for all aspects of the water resource field, and not just include the piping experts.

It does mean developing of resource flood management and its impact on water supplies. Likewise, the toxics issue. Now, priority efforts of this organization could include the identification of the real value of water to our modern society, development of a management structure and capital planning process for efficient and effective population of various size water utilities.

I think that is a very important aspect. We are going to be spending large sums of money in the years ahead, and indeed we must, and it is very important that we do that in making use of the best possible managerial talents we can lay our hands on.

We also have to establish a system for determining the true cost of service, and also the required financing for developing, operating, and maintaining these reliable systems which are needed, not the least of which or last of which, development of a public information program to convey all of these matters to the general public as well as the public agencies that regulate rates, so that adequate and proper rate structures can be established to provide the necessary financing in the years ahead.

Now, if I can just switch gears a little bit here, because it is, I feel, another very important issue in New Jersey, and that deals with the growing centers that we have in New Jersey.

Most of us are familiar with the growth taking place in Camden and Atlantic City, the eastern Middlesex County, and the Route 1 corridor between Trenton and New Brunswick, as well as the northern part of Ocean County.

Now, unlike the northeastern part of the State where the primary source of water is the surface water supply, these developing areas are currently dependent almost entirely in some places or partially in others on ground water supplies.

Now, the state of the art of ground water management is, I would not say at its birth, but it is certainly not as mature as how we manage surface water supplies or I dare say some would be critical how we manage the surface water supplies.

Overuse of the ground water in these areas has resulted in severe declines in the water levels of these major underground reservoirs which are in effect formed by the water-bearing soils, soil formations which we commonly refer to as aquifers.

These lowered levels create critical conditions which can result, as it has in some areas, in the movement of salt water into the freshwater supplies. Mining of the ground water, that is, taking more out than Mother Nature is putting into it, has to be dealt with before we destroy one of New Jersey's most valued resources.

This problem, misuse of the ground water resource, is not only to be found in New Jersey. There is ample evidence reported in the newspapers and the professional journals that there is misuse in the rest of the United States as well. Effective management techniques and programs must be developed and implemented before we lose one of the most valued treasures of this country.

The U.S. Geological Survey has the expertise and the experience to provide the leadership and the assistance in this important work. Increased Federal commitments, in my judgment, in this area are vital if we are really to solve the problem of providing the techniques and the tools and leadership for ground water management.

Now, DEP, I believe, in this State is at the leading edge of trying to address this problem. They have, in fact, started a program to implement management of the ground water in the South River Basin—that is the eastern part of Middlesex County—and Monmouth County as well as northern Ocean County.

This ground water critical area's program will also be applied shortly to two other developing areas, Camden and Atlantic Counties.

The current commitment of significant manpower and dollars by the DEP, including contracts with the U.S. Geological Survey, will develop these effective ground water management programs and will provide the key to the protection of these resources.

I want to stress we have much to learn before we truly have a comprehensive management program for this resource, which provides somewhat or just about half the supply of the water in the State.

Now, this work will establish the requirements for alternative sources of surface supply, and ultimately, the development of the necessary ground water management tools and programs should lead to the most effective utilization of both surface supplies and ground water supplies together, what is commonly referred to as the conjunctive water, so you can maximize the efficiency of the management of the resources.

I just want to give you an illustration. The authority is developing the Manaque water supply project in Monmouth County. Standing all by itself as only a surface water supply, it can be rated at a $30 million system. Our consultants have indicated that when we get smart enough in terms of ground water management, we can operate that surface supply conjunctively with the ground water supply, and permit the surface supply to deliver up to 45 million gallons a day.

That is about a 50-percent increase in the supply. That is just to give you some order of magnitude of the potential for effective conjunctive use of surface and ground water. Before that can be truly accomplished, though, we really have to get on with the business of developing the techniques and the tools which then get back to the importance of the U.S. Geological Survey.

[The prepared statement of Dr. Ricci follows.]

ROCCO D. RICCI, EXECUTIVE DIRECTOR
NEW JERSEY WATER SUPPLY AUTHORITY

# TESTIMONY TO THE
# UNITED STATES SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
# SUBCOMMITTEE ON WATER AND POWER

AUGUST 6, 1985
HACKENSACK, NEW JERSEY

Over the past twenty years we have experienced a number of droughts in California and the Northeast which should provide ample evidence of the economic value of adequate water supplies. New Jersey's droughts of the 1960's, 1980-1981 and the current drought, as well as the failure of the Trenton system in 1975, can provide valuable information about the potential economic impacts on industrial and commercial activities and their employees, costs to government and the importance of adequate and well-maintained water supplies to the general health and safety of our modern society and the role of adequate water supplies in planning for future economic development.

As a direct result of the 1980-1981 drought, New Jersey initiated a number of programs to begin to address the deficiencies in the water supply systems throughout the State. Included are efforts to deal with the development of new water supplies by the construction of reservoirs, completion of new diversion facilities, development of management tools to properly make use of the State's groundwaters, financial programs to provide loans for system rehabilitation and interconnections. More effective water supply management laws and regulations have been or are about to be put into place to properly plan, develop and protect the State's water resources. All of this has the financial support of $350 million which is available from the Water Supply Bond Act of 1981.

Throughout the U.S. there has been a growing awareness of the decay of the nation's infrastructure. Collapse of bridges, failure of sewers and frequent water main breaks in many of our older urban centers give ample evidence of the critical nature of this problem. Over the years many of our water supply systems have suffered from the lack of attention to maintenance, systematic rehabilitation and replacement, and other capital improvements necessary to provide continuing reliable and effective water supplies. There are many pieces to an understanding of how we have allowed this to occur; however, there is a compelling need for the professionals in the field and the general public to fully understand what will be required to correct the existing water supply deficiencies, to properly operate and maintain the systems in the years ahead and to provide for an orderly and realistic financing of these vital services.

There is a need for a recognition of the importance of providing New Jersey and the nation with water supplies based upon realistic planning, public understanding of the value of water to our society, establishment of effective management practices for the water utilities and the development of adequate pricing of the water. Over the past year a committee comprised of representatives of industry, government, educational institutions and the general public have identified the indicated significant water supply issues, questions and programs. They have proposed the creation of a Water Resource Management Center at the New Jersey Institute of Technology. The establishment of the Center would provide the basis for demonstrating the effectiveness and efficiency of a State, Federal and local partnership in addressing the various water supply issues and questions. A keystone of this effort is the development of a heightened public awareness and recognition of the interests of various sectors of modern society. The creation of a Water Resource Management Center at the New Jersey Institute of Technology would provide a professional center to carry out various water resource programs included in the Project, establish a data center for effective analysis of water resource issues and develop and implement an educational program to provide trained professionals for the water supply field to meet the needs of the region. Priority efforts would include the identification of the real value of water to society; development of a management structure and capital planning process for efficient and effective water supply systems; establishment of the basis for determining the true cost and required financing for developing, operating and maintaining reliable and effective water supply systems; development of a public information program to convey all of the above so that adequate rate structures can be established.

A number of areas of New Jersey are feeling intense growth pressures, namely, the Camden and Atlantic City regions, eastern Middlesex County, the developing Route One corridor between Trenton and New Brunswick, Monmouth County and the northern portion of Ocean County. Unlike the northeastern part of the State where the primary water supply comes from surface waters, the developing areas indicated are currently dependent upon groundwater withdrawals for most or all of their supply. Overuse of the groundwaters, especially in the Camden, eastern Middlesex, Monmouth and northern Ocean Counties, has resulted in severe declines in the water levels in the major underground reservoirs created by water bearing soil formations referred to as aquifers. The lowered levels create critical conditions which can result, as it has in some areas, in the movement of saltwater into the freshwater supplies. Mining of the groundwater, that is, withdrawing quantities which are greater than the amount which is added by rainfall replenishment, must be curtailed before we destroy one of the State's most valued resources. This problem of misuse of the groundwater resource is to be found in many parts of the U.S. Effective management techniques and programs must be developed and implemented. The U.S. Geological Survey has the expertise and the experience to provide the leadership and assistance in this important work. Increased federal commitments for this effort are vital to the protection and management of the groundwater resources.

The DEP has started to implement a program to significantly reduce the existing use of groundwater in the South River basin, Monmouth County and northern Ocean County. This groundwater "critical areas" program will also be applied to the Camden and Atlantic County areas. The current commitment of significant manpower and dollar resources by the DEP, including contracts with the U.S. Geological Survey, to develop effective groundwater management programs, is the key to the protection of these resources. This work will also establish the requirements for alternative sources of surface water supplies for existing and future needs. Ultimately, the development of the necessary management tools and programs will lead to the most effective utilization of both surface and groundwater supplies to satisfy the needs of the areas.

Until recently, development has taken place in these areas without careful consideration of the limitations of the groundwater supply. The existing use of groundwater from the aquifers of Monmouth County is probably going to be reduced by 30 to 50 per cent under the DEP's "critical areas" program. The water supply utilities in the area will be required to identify the measures to be taken to replace the restricted groundwater use. Conservation programs should assist in this effort; however, new surface water supplies must provide the bulk of the required supply for the existing and future needs.

The New Jersey Water Supply Authority is developing the Manasquan Reservoir System in Monmouth County. This new surface water supply will provide a yield of 30 million gallons per day, most of which should be used to replace existing groundwater use. The efforts of the DEP and the U.S. Geological Survey will result in a better understanding of how to manage the groundwater resources in the future in conjunction with the new surface supply. The Authority's consultants have, for example, estimated that the surface supply may be operated in conjunction with the groundwater systems to deliver up to 45 million gallons per day, a potential for a 50 per cent increase in the use of the surface supply. This example illustrates the importance of an increased federal commitment to groundwater management through the U.S. Geological Survey in New Jersey and throughout the U.S.

Senator **Bradley**. Thank you very much, Dr. Ricci, for your testimony. I will withhold questions until all the panel has read their testimony.

Mr. Tompkins.

## STATEMENT OF J. RICHARD TOMPKINS, PRESIDENT, MIDDLESEX WATER CO.

Mr. **Tompkins**. Good afternoon, Senator.

I also would like to thank you for this opportunity to present my testimony to this panel, and because of the time limitations, I will try and just summarize the prepared statements that I have given to the panel before.

I would like the complete statement put in the record, and I will just highlight this.

Senator **Bradley**. Your complete statement will be placed in the record.

Mr. **Tompkins**. And hopefully have additional time for questions.

In my judgment, this hearing could not be taking place at a better time. The quality and adequacy of our water supplies have been the subject of considerable public press and official attention for most of this year.

With one of the driest springs on record just behind us, it is understandable that questions have been raised, as they were in the late sixties and again at the beginning of this decade about New Jersey's ability to deal with a sustained period of rainfall shortage.

While late spring and early summer rains diminished what many regarded as the climate of crisis, the looming drought gave those of us in the water business an opportunity to see how effective our efforts had been, and to test our ability to work with government to respond to the difficult challenges.

To be sure, there were some rough edges, but far more important, we found that with a working relationship with government, we had the knowledge, ability, and expertise to deal with the problem effectively.

On May 2, the Department of Environmental Protection announced that agreements had been worked out between water purveyors and Government agencies for the transfer of water supplies necessary to offset the effects of the impending drought.

These transfers, together with limited restrictions on nonessential uses of water, provided the assurance of the continued supply of water through the expected dry period for those areas of the State that might have been in need.

This agreement was the New Jersey water supply master plan and work. Interconnections between purveyor systems which were established since 1981 as part of the master plan provided the capability to transfer water supplies between major river basins in order to offset the effects of droughts and emergencies.

The Round Valley-Spruce Run water supply development built by the State in 1960 and operated by the recently created New Jersey Water Supply Authority under the expert guidance of Rocco Ricci has proven its ability to supply the unrestricted needs of the central New Jersey customers and also provide for major transfers to the deficient systems in the northern part of the State.

In conjunctive operation and management of Round Valley-Spruce Run with the Delaware and Rariatan canal provides additional capabilities for transferring and storing water reserves throughout most of New Jersey. Additional projects are now under study by the water supply authority that will further improve and expand these capabilities in establishing regulations relating to the drought emergency.

State officials recognize these capabilities and limited restrictions to those areas where deficiencies were known and projected. We, Middlesex Water Co., are a customer of the water supply authority. We have been a customer over the past 16 years of this particular water supply development, which has an adequate supply.

During the drought, in the early eighties, the Middlesex Water Co., suffered economic losses because of drought restrictions placed on a blanket basis throughout the State. Our dealings with the Department of Environmental Protection, and particularly with the drought coordinator, resulted in our service area being excluded from restrictions, and we were able to utilize those supplies for our customers, and they paid for them.

The implications of what I have described extend far beyond the management of water supplies during one relatively brief period of cooperative action between government and private water purveyors. It means and marks the forging of a partnership that can play an important role in solidifying New Jersey's continued identification as an ideal location.

Just as that partnership is working effectively in dealing with water supply problems, so, too, it can work in responding to water quality problems. New Jersey is hard at work in cleansing its environment, and New Jersey's water purveyors wish to do everything we can do to help.

While we will bring the full measure of our scientific and engineering expertise to bear in testing and treating our water supply, we are not responsible for having caused whatever contaminations it may contain. We need laws and regulations to eliminate and remove contaminants from the environment.

Although New Jersey has enacted water quality legislation that will establish maximum contaminant levels for a list of toxic organics in public water supplies, most of these chemicals can be purchased over the counter in any hardware or paint store or even in the supermarket.

As long as these contaminants are readily available, to the public, they will ultimately find their way into the water supply, and must be removed by water purveyors. With all the knowledge and experience that is available among the private water purveyors of this State, we believe that we can play an important role in helping to develop effective regulations in this area.

It does not make sense simply to send out copies of what may be ill-conceived or inadequate regulations thought out by an insulated bureaucracy. A more sensible approach would be to request our advice where available to you and to the State, and are anxious to help.

My central message to you today is, call on us. We are a resource. Let's be partners in forging a New Jersey we can all be proud of.

Thank you for your attention.

[The prepared statement of Mr. Tompkins follows.]

**Mailing Address**
P.O. Box 1500
Iselin, New Jersey 08830

IDDLESEX
ATER COMPANY / 1500 Ronson Road, Woodbridge Township, Iselin, New Jersey 08830
201 - 634-1500

STATEMENT BY

J. RICHARD TOMPKINS

PRESIDENT, MIDDLESEX WATER COMPANY

BEFORE SENATE HEARING

TUESDAY, AUGUST 6, 1985

Good morning. My name is J. Richard Tompkins. I am president of Middlesex Water Company, which is headquartered in Woodbridge, New Jersey and serves approximately 200,000 residents of the Townships of Edison, Woodbridge and Clark, and the Boroughs of South Plainfield, Metuchen and Carteret.

I am pleased that Senator Bradley's office has asked me to appear before you this morning to present my views with regard to the problems and opportunities facing New Jersey's water industry.

I believe that it is important to note that New Jersey is enjoying one of the greatest periods of economic prosperity in its history. More people are employed in New Jersey than ever before and unemployment in our state is well below the national level. One has only to travel the highways of this state to realize that the construction of office buildings, commercial centers, high-tech laboratories and housing is proceeding at an unprecedented pace.

Clearly, New Jersey has been identified as an ideal location for business and for living. However, "ideal location" implies a number of important "givens." In order to be "ideal," a location must offer market and job opportunity, climate, transportation, cultural activities, desirable neighborhoods and a host of other qualities. But, perhaps the most basic of all the "givens" is an abundant supply of high quality water. Without it, no location could ever be thought of as "ideal." With it, and with the full menu of other qualities New Jersey has to offer, our prosperity knows no bounds.

In my judgment, this hearing could not be taking place at a better time. The quality and adequacy of our water supply have been the subjects of considerable public, press and official attention for most of this year. With one of the driest springs on record just behind us, it is understandable that questions have been raised -- as they were in the late sixties and again at the beginning of this decade -- about New Jersey's ability to deal with a sustained period of rainfall shortage.

While late spring and early summer rains diminished what many regarded as a climate of crisis, the looming drought gave those of us in the water business an opportunity to see just how effective our efforts had been and to test our ability to work with government to respond to difficult challenges. To be sure, there were some rough edges, but far more important, we found that with a working relationship with government, we had the knowledge, the ability and the management expertise to deal with the problem effectively.

On May 2, the Department of Environmental Protection announced that agreements had been worked out between water purveyors and government agencies for the transfer of water supplies necessary to offset the effects of the impending drought that threatened certain areas of the state. These transfers, together with limited restrictions on non-essential uses of water, provided the assurance of a continued supply of water through the expected dry period for those areas of the state that might have been in need.

This agreement was the New Jersey Water Supply Master Plan at work. Interconnections between purveyor systems, which were established since 1981 as part of the Master Plan, provided the capability to transfer water supplies between major river basins in order to offset the effects of droughts and emergencies.

The Round Valley/Spruce Run water supply development, built by the State in 1960 and operated by the recently created New Jersey Water Supply Authority, has proven its ability to supply the unrestricted needs of its central New Jersey customers and also provide major transfers to the deficient systems in the northern parts of the state. The conjunctive operation and management of Round Valley/Spruce Run with the Delaware and Raritan Canal supply provides additional capabilities for transferring and storing water reserves throughout most of New Jersey. Additional projects are now under study by the Water Supply Authority that will further improve and expand these capabilities.

In establishing regulations relating to the drought emergency, the state officials recognized these capabilities and limited restrictions to those areas where deficiencies were known and projected.

The implications of what I have described extend far beyond the management of water supplies during one relatively brief period of cooperative action between government and private water purveyors. It means the forging of a partnership that can play an important role in solidifying New Jersey's continued identification as an "ideal" location.

Just as that partnership is working effectively in dealing with supply problems, so too can it work in responding to water quality problems. New Jersey is hard at work in cleansing its environment and New Jersey's water purveyors want to do everything we can to help.

While we will bring the full measure of our scientific and engineering expertise to bear in testing and treating our water supply, we are not responsible for having caused whatever contaminations it may contain. We need laws and regulations to eliminate and remove contaminants from the environment.

Although New Jersey has enacted water quality legislation that will establish maximum contaminant levels for a list of toxic organics in the public water supply, most of these chemicals can be purchased over the counter in any hardware or paint store or even in the supermarket. As long as these contaminants are readily available to the public, they will find their way into the water supply.

With all of the knowledge and experience that is available among the private water purveyors of this state, we believe that we can play an important role in helping to develop effective regulations in this area. It doesn't make sense simply to send out copies of what may be ill-conceived or inadequate regulations thought up by an insulated bureaucracy. A more sensible approach would be to ask for our advice. We're available to you and we are anxious to help.

My central message to you today is, "Call on us... we are a resource. Let's be partners in forging a New Jersey we can all be proud of."

Thank you for your kind attention. I will be happy to answer any questions you may have.

Senator BRADLEY. Thank you very much, Mr. Tompkins, for your testimony.

Mr. Gerber.

### STATEMENT OF ROBERT A. GERBER, PRESIDENT AND CHIEF EXECUTIVE OFFICER, UNITED WATER RESOURCES INC.

Mr. GERBER. Thank you, Senator Bradley, for this opportunity.

My name is Robert Gerber. I am president and chief executive officer of United Water Resources and its principal subsidiaries, Hackensack Water Co. of New Jersey and the Spring Valley Water Co. of New York. Together, these two companies furnish water to approximately 1 million persons on the west side of the Hudson River between Jersey City and the Bear Mountain Bridge.

Although drought conditions now prevail along the east coast, ample quantities of water will be available in northeastern New Jersey next year when the main components of the Wanaque South water supply project are placed in service.

What is so unfortunate is that this joint undertaking of the North Jersey District Water Supply Commission and Hackensack Water Co., would have relegated this year's drought and the one in 1980 and 1981 to inconsequential events.

The 5 years it took to gain approval is the principal reason for the present unhappy state of affairs. When the last element of the project is completed in 1987, 13 years will have elapsed since official application was made.

This is an unacceptably long time to complete any project, yet future ones are apt to take longer, given the increasing degree of regulation at the State and Federal level.

New Jersey, to its credit, has taken action to facilitate speedier review and approval, but where additional Federal approval is needed, those proceedings generally begin only after the State approval is granted. While American industry moves to fast track urgently needed projects, government and its multitude of agencies could do no better than to operate serially.

Moreover, no workable arrangement is available for consultation on environmental issues. Only an adversarial position is offered. No time limits are set, and with some intervenors due process translates freely into do nothing.

Time limits should be established for Federal review of water resources projects. Otherwise, as the New York Times observed recently, a water supply project proposed today will take 20 years to complete, which is an awfully long time to stay thirsty.

Hoover Dam was authorized by the Congress in 1928, and by 1934 was in operation. Seven years to design and build one of the world's greatest civil projects. And I cannot help reflecting that in one other 12-year period both World War II and the Korean war were fought.

I have four other points which will just take a few more minutes.

Point Two is that the Federal Government should encourage cooperation regarding the development of interstate water resources. In that connection, we must guard against an unwise prohibition of interbasin transfers. Certainly indigenous interests must be safeguarded, but not mindlessly.

More to the point, New Jersey must not be excluded from any future plan to utilize or develop the Hudson River.

Point 3 is that the Federal Government should avoid water regulation by statute. That is what agencies are supposed to do. Nonetheless, parts of the amendment to the Safe Drinking Water Act now in conference encroach on what wisdom has shown should be left to the regulators.

The need for additional factual resource data goes on relentlessly, and is my Point Four. And I agree completely with Rocco on that. And the U.S. Geological Survey merits continued support.

By way of example only, farm irrigation continues to grow in the mid-Atlantic States, and agricultural usage often dwarfs consumption by public water systems and industry. The quantities and intensity of use for agriculture are only poorly defined. As a result, equations of supply and demand are often incomplete.

My last point concerns Federal funding. There simply is no reason why a public water supply in the United States should not be self-sustaining. In fact, most of them are. For that reason alone inequities immediately result when Federal or State grants are the reward for years of neglect.

Loans, on the other hand, may fill a need where creditworthiness is a problem. New Jersey in 1981 took the lead in water supply planning for which it may be justly proud, and even went the second step and provided a pool of lendable funds to be used for rehabilitation and new projects.

Unfortunately, it did not allow borrowing by investor-owned companies, some of which, especially the smaller ones, faced difficult financing problems. Thus the playing field is not quite level. And it would tilt more if Treasury II is passed.

The stores of regulated water companies would be cut off from the benefits flowing from tax-exempt financing made possible through the various State Economic Development Authorities. What is more, without the assistance of the New Jersey Economic Development Authority, it is doubtful that the Wanaque South project could have been financed.

To sum up, in spite of the current drought, New Jersey's water situation is manageable, and long-term relief is assured.

Nationally, unless there is more decisiveness within reasonable time frames, needed water resource development will continue to be late. A deeper and more troubling problem may be the perceived negative bias that seems to emerge whenever a new proposal to develop this nation's water resources is announced.

That concludes my statement.

[The articles attached to Mr. Gerber's statement follow:]

[From the New York Times, July 10, 1985]

## SAVE, AND THINK ABOUT, WATER

For the third time in 20 years, fences and foundations that are ordinarily submerged under New York City's reservoirs of water stand high and dry. That the city has been exposed to three droughts in so brief a span is a sure sign that its strategic water planning is remiss.

Since no one knows how to order up rain, water planning is restricted to three elements. One is climate. New York's reservoir design was based on the records of more than a century of rainfall. But many climatologists forecast declining precipitation. Some also foresee a rise in the level of the oceans, which could raise the salt content of the lower Hudson and decrease its suitability as a source of potable water.

A second element is better understanding of per capita consumption. It has been rising at a compounded rate of 1 percent a year. No one knows why. Leakage from old mains may be increasing; more appliances or new uses like auto washing may encourage extravagance. New York's apartment dwellers cannot be directly charged for water so their pocketbooks do not counsel conservation.

The third essential is selecting alternative sources of supply, a choice burdened by chemical, financial, environmental and political concerns. The simplest remedy, at least in an emergency, appears to be skimming the Hudson River upstate. The city should now start its Chatham emergency pumps to stretch supplies by 8 percent. But siphoning more than this 100 million gallons a day is impossible without extensive construction, during which the Delaware aqueduct would have to be shut off. New reservoirs would be formidably expensive and environmentally challenged.

The water crisis that looms for 1985 does not arise from any recent mistake in planning. For the immediate future, there is little to be done except to save and save, fix the leaks and punish the indifferent. For the long range, it would be wise to plan for a string of droughts. Plottng and providing a major increase in water supply can easily take 20 years.

---

[From the New York Times, Nov. 20, 1984]

## HOW E.P.A. FAILS TO GUARD OUR WATER SUPPLY

To the Editor:

"Toxic Threat Seen to Water Supplies" (news article, Oct. 25) cites the Environmental Protection Agency's new report, which states that provisions of the Resource Conservation and Recovery Act (R.C.R.A.) of 1976, requiring monitoring of ground-water contamination, are being routinely violated. Specifically, the study says less than 20 percent of the hazardous-waste-disposal sites known to be subject to monitoring requirements are in compliance with the law.

This comes as no surprise to me or probably to the rest of Congress. In fact, the poor performance of the E.P.A. in implementing and enforcing the key components of R.C.R.A. led to strong bipartisan support and passage of an R.C.R.A. reauthorization this year. This strengthens substantially provisions of the program and mandates deadlines for E.P.A. implementation. Continued E.P.A. inaction will now trigger automatic alternative requirements, such as bans on certain disposal practices.

Unfortunately, E.P.A.'s poor performance or its statutory responsibilities is not restricted to R.C.R.A. Congress learned from a General Accounting Office Investigation and hearings in 1983 that over 146,000 violations of the Safe Drinking Water Act occurred in 1980 alone, and the E.P.A. has referred only 21 cases to the Department of Justice for enforcement action in the entire history of the act over the last 10 years.

No enforcement action has been attempted by E.P.A. in any state that has been granted primary enforcement responsibility, even though the law provides for E.P.A. oversight and action when the state fails to act. We are now seeing an analogous situation in the R.C.R.A. program.

The Office of Technology Assessment's report on ground-water protection, released Oct. 26, stated: "Contamination of ground water has occurred in every state and is being detected with increasing frequency . . . contaminants found in ground water are associated with adverse health, social, environmental and economic impacts . . . public health concerns arise because some contaminants are individually linked to cancers, liver and kidney damage and damage to the central nervous system . . . as experience with hazardous wastes has shown, the cost to clean up contamination can be enormously greater than the cost to prevent contamination.

Ground-water protection is paramount when one considers the enormous value of this resource. It represents 96 percent of the nation's fresh-water supply; it was used at a rate of 90 billion gallons a day in 1980. One half of the U.S. population and 95 percent of rural America depend upon it for drinking water.

The threat to the resource is equally impressive; over 200 substances have been detected in ground water, yet E.P.A. has established only 22 mandatory water-quality standards. Twenty-nine percent of the drinking water supplied for large cities by ground water is contaminated with violative organic chemicals.

Most important with regard to R.C.R.A., 27,000 of the 181,000 surface impoundments are known to contain toxic and/or carcinogenic chemicals. Thirty-five percent of the Industrial impoundments are unlimited, and 30 percent sit directly over ground-water sources with no barrier between the hazardous waste and ground-water supply.

Because of E.P.A.'s failure to act responsibly, Congress has been forced to be more prescriptive and limit the agency's discretion by mandating actions, instituting deadlines and legislating automatic alternative requirements when the agency does not meet statutory deadlines. For the sake of our country's natural resources and the health of our people, we look forward toward real progress in cleaning up pollution and preventing further environmental contamination.

DENNIS E. ECKART,
*Member of Congress, 11th Dist., Ohio.*

Senator BRADLEY. Thank you very much, Mr. Gerber.

Let me thank the entire panel for their testimony. I would like to ask a few questions now.

Mr. Ricci, Why would you like to see the water resources management center at the New Jersey Institute of Technology?

Mr. RICCI. That wasn't just a personal opinion, Senator. That was the consensus of this group of people. The New Jersey Institute of Technology has already done a great deal of work for private entities, particularly the State, including the New Jersey Water Supply Authority, water resource management computer analysis, rule curves for operations of the systems.

But in addition to that—I think I am right on this—I think it is the largest technological center in this tri-State region. It has a pool of other universities in the State as well as its neighbor, and has colleagues in other States to draw upon, and the attempt was to use that resource center in conjunction with the others.

Senator BRADLEY. Mr. Tompkins and Mr. Gerber, do you agree with Dr. Allee's statement that water systems have a 50-percent leakage rate?

Mr. TOMPKINS. Well, speaking for Middlesex Water Company, our what we call unaccounted for water is below 10 percent.

Nationally I believe the reasonable average for leakage in our water system is in the area of 15 to 20 percent. There is some room for improvement there. I don't agree that leak detection is a part of conservation. I think that leak detection is a standard operating procedure for any facility.

Senator BRADLEY. Mr. Gerber.

Mr. GERBER. Yes; I think Mr. Tompkins has made a good statement. It is a bit misleading to take the figure of unaccounted-for water and equate that to leakage, because in unaccounted-for water you have a lot of varieties of uses that aren't metered. For example, fire drills, firefighting, street flushing, sewer flushing, those things aren't metered.

And there certainly are some bad systems—there is no question about that—where leakage is excessive. How much savings would be there, I think, is fuzzily defined at the moment, though. It is cheap water. There is no question about that.

Senator BRADLEY. Mr. Ricci, did you make the point that conservation is less expensive than new sources?

Mr. RICCI. Yes; I did make that—I'd like to just make one comment.

Senator BRADLEY. You said it was expensive, but less expensive than developing new sources.

Mr. RICCI. That is the important part of what I was trying to suggest before. We really don't know the condition of mostly public systems. The leak detection in the private industry is really part of their bottom line, but most municipal systems really haven't the slightest idea as to how bad their basic infrastructure is, and to correct it is undoubtedly going to be costly, but it is a lot, I believe—a personal opinion—a lot cheaper than going out to try and build a new reservoir if you need to for an equal amount of water.

What has been reported—I can't substantiate this—what has been reported in one of our largest cities in this State is that the leakage might even be around that 50-percent figure. I can't verify that.

Senator Bradley. Therefore, would you agree that leakage of a private system is in the 10 percent range or less, while municipal systems have a much higher leakage figure?

Mr. Ricci. I think that would be reasonable.

Senator Bradley. Is there anything the Federal Government can do to facilitate more efficient system?

Mr. Ricci. As a matter of fact, the Corps of Engineers in the New York office has been working with—I believe it is Jersey City to deal with some transmission piping.

Senator Bradley. Did they repair it when it broke.

Mr. Ricci. But they also made some studies as well, I believe, but they certainly would be equipped to assist the systems to address their problems and evaluate just how serious it is, and more importantly, find out how much it is going to cost to correct it, and equally as important, to establish priorities as to how you spend your money. You can't correct the whole problem all at one time. So those priorities are equally as important in the financial planning.

Senator Bradley. I was intrigued by your conjunction between surface and ground water systems, particularly in those areas of the State that now depend on ground water. What are the next steps in making this a reality? You mentioned enmeshing the systems.

Mr. Ricci. The next steps are being taken by DEP. As a matter of fact, General Woodmore, who is in the audience here, heads up the program at the State level and their efforts are to take the next steps, those critical areas. The program puts in place the regulatory process which will lead this fall to telling people in the areas I have mentioned in Monmouth County that they will have to reduce their existing use of ground water by 30 to 50 percent.

The number hasn't been announced as yet. That is a substantial reduction in existing use, coupled with the——

Senator Bradley. They will probably do it after November. [General laughter.]

Senator Bradley. Go ahead.

Mr. Ricci. The fact is that that is the driving force which will ultimately require the municipalities and private systems to conjunctively use Manasquan water together with ground water. So that is in place already.

Senator Bradley. As you look at the next 10 to 15 years, do you see this kind of conjunction of surface and ground water necessitating less water being taken from, the Pinelands aquifer, or do you see more water being taken from there?

Mr. RICCI. I am not in a position to talk about water being taken from the Pinelands aquifer.

Senator BRADLEY. Is that a Federal problem?

Mr. RICCI. No; that is a State problem. Certainly the Federal Government is involved in that. Personally, I think that there will come a time——

Senator BRADLEY. Do you agree that the more you interconnect surface and ground water systems, the longer the ground water resource will exist.

Mr. RICCI. You have got to manage the resource so you don't destroy it completely. That is the bottom line.

Senator BRADLEY. I am interested in the uncertainty of trying to provide water in a world where, there is the potential for contamination by toxics. Is it true that until you eliminate the toxics they will inevitably be in the water supply?

Let's assume that we make a good faith effort to try to regulate the toxics, and at the same time we know we are not going to exclude them from the production process in the country. What would you suggest that we do? How could we help you?

Mr. TOMPKINS. Well, I think in the cleaning industry a lot of the chemicals used in drycleaning were simply dumped into the ground, and this represents a major threat of contamination to all of our well supplies. We are presently monitoring our well supplies for these contaminants and have not found any as yet, even though the State is only setting preliminary MCL's.

But we know within the drainage basin there have been some of these establishments, and that this may ultimately find its way into our supply.

Senator BRADLEY. Therefore, the disposal regulations affecting clean water should go down to a smaller level of enterprise?

Mr. TOMPKINS. I think it has to. It has to bring these contaminants into a central treatment plant for treatment and discharge with complete removal.

Senator BRADLEY. Therefore, you are in favor of complete treatment for contaminated water?

Mr. TOMPKINS. For the future, yes.

Senator BRADLEY. What is your opinion Mr. Gerber?

Mr. GERBER. The old New England theory about developing water supplies, when you get a good source, protect it, I think the wisdom of that is still profound, and I believe the water suppliers have been in the vanguard of protecting those sources.

It is unfortunate that we have surreptitious dumping, and we also have planned dumping in areas where we shouldn't have dumps. On the other hand, I can't help but comment about the amendment to the latest water resources bill, at least in the House, dealing with the Rockaway situation. No knowledge about the merits of that. The fact is that we are dealing with a statute and being regulated by a statute, which is unwise policy as far as I am concerned.

Senator BRADLEY. Let me ask you, are there differences in rates charged on municipal and investor-owned water companies? And if so, what are they?

Mr. GERBER. I can answer that by saying there are differences in the rates of investor-owned companies when they are compared, and yes, there are differences in rates, and they are generally fairly substantial.

My own company's rates are on the high side in Hackensack, and, of course, we have a $200 million improvement under way. In New York, in the Spring Valley Water Co, where the investment is relatively new, the rates are also high. New investment means higher rates. We are working in new dollars, not old dollars, and this has to be reflected, I think, all over the country. When you do new work, you are going to pay more. I don't know how to avoid that.

Senator BRADLEY. Mr. Tompkins?

Mr. TOMPKINS. Well, I think our rates are higher than municipal because of the fact that the investor-owned utilities in New Jersey pay approximately 13.5 percent of every dollar in franchise gross receipts tax to the State, which is returned to municipalities that municipal systems do not.

We also pay Federal income tax, which has an effective rate of somewhere around 40, 46 percent.

Senator BRADLEY. What do you mean by an effective rate of 46 percent?

Mr. TOMPKINS. On your income. And this is quite high. So naturally you would expect our systems to have rates that are higher than municipal systems. We also are entitled to a return on investment which we try to achieve as most of the municipals do not.

They retire their debt service, and then don't pay a return on that system. So we would expect investor-owned utilities to be high, but I think their performance and their assurance of supply supports their record of continuity as compared to municipal systems.

Senator BRADLEY. Both of you said that the difference is significant. Can you tell me what the basic difference in rates is?

Mr. TOMPKINS. Some of the neighboring systems were about, I would say, between 25 and 30 percent higher in rates. If you were to eliminate the taxes, you would find that our rates in many cases would be lower than municipal systems.

Senator BRADLEY. If you eliminated the gross receipts tax or the gross receipts and the Federal income tax?

Mr. TOMPKINS. Both of them.

Senator BRADLEY. Speaking for the one that I have some responsibility for, I don't think it is likely that you would be exempt from Federal income tax.

Mr. TOMPKINS. Absolutely. But as Bob pointed out, the change of the tax-exempt status for EEA financing would have a significant effect on investor-owned utilities.

Senator BRADLEY. Let me ask you, are public water companies subsidized in any way?

Mr. GERBER. No; they are not subsidized at all. Possibly someone could make an argument indirectly. I am not sure how that would work. But the fact is that water now costs less than newspapers. Our water rates won't buy you two newspapers a day. That is what it has been.

Senator BRADLEY. Could you explain that further?

Mr. GERBER. What you are paying for water today won't furnish you with two newspapers. And that is the way it has been. It has been that way for years. Generally I have looked in my own company, and I have checked. I have lived in the same house, just to make it a little bit more personal, for 25 years, and my taxes have gone up more than the water rates have gone up.

And the water rates have gone up just a little bit less than the CPI, and we are talking about over that period something between 6 and 7 percent compounded.

Senator **Bradley**. You talked about the price differentials between municipal and investor-owned. Do consumption patterns, track that price differential? Is cheaper water consumed more?

Mr. **Tompkins**. I don't think the cost of water yet has gotten to the point where people will reduce consumption because of price. The average bill in our company runs from about $175 to $200 a year for all the water that you would like to use. Some of it on lawn and outside uses might run about $100 a year.

When you compare that to the cost of some of the other necessities, such as cable television and telephone, I think you will find it is quite economical.

Senator **Bradley**. Are you able to buy and sell water to each other?

Mr. **Gerber**. We are able to buy and sell in a way, but it is very awkward, and the price statute in New Jersey does not allow free pricing beyond some range, and if there is a dispute on price by either one of the parties, eventually that would be adjudicated by the State, so there is some opportunity for free pricing.

Senator **Bradley**. What is the central regulatory body?

Mr. **Gerber**. In this case the statute identifies the Department of Environmental Protection during drought.

Senator **Bradley**. What about pricing generally?

Mr. **Gerber**. Pricing in general, in our case it would be the Board of Public Utilities.

Senator **Bradley**. In beginning to think long-range about this issue, does the present number of water companies in New Jersey make sense or should there be some kind of consolidation?

Mr. **Ricci**. The number, I think, Senator, is like 634. That represents a lot of small, privately owned systems.

Senator **Bradley**. That doesn't include my own personal water system, which is my well.

Mr. **Ricci**. I think my answer is, my personal opinion is that there has to be consolidation, not to a point where there are monopolistic practices, but I believe it is in the interests of water supply in the State to have some.

Senator **Bradley**. How best could we best affect that?

Mr. **Ricci**. All right. Now, the DEP has a statute which was passed in 1981 also which sets forth mechanisms for consolidation of the most difficult problems, that is, the small systems, and requiring others to take over the system, and the process is beginning to be implemented in at least one part of the State that I am aware of. So I guess we have to see how successful that is. I am not so sure that that is going to be all that successful.

Senator **Bradley**. As we consider the next 10 to 20 years should we look to the region as being supported by the Delaware, Hudson, and the Susquehanna Rivers, and plan in those terms? Or should we look only in terms of Delaware and Hudson? Or should we look only in terms of Delaware, with ground water being our backup in New Jersey?

Mr. RICCI. I believe between now and the end of this century, or perhaps even as far into the first 20 years of the next century, there are ample projects within New Jersey which can be developed, including the proper management of ground water resources, but given the life, and Mr. Gerber mentioned the number of years it takes to get water supply projects going, projects such as the Hudson River, which I think really is the next step, should be started now in terms of its environmental analyses, working out the fiscal problems, the institutional problems, so that when it is needed at the beginning of the next century, perhaps, after the State's intrastate systems are developed, that it would be ready to go, it would be available.

Senator BRADLEY. Do either of you want to comment on that?

Mr. GERBER. I feel very strongly that the Hudson and Delaware Rivers ought to be related. They shouldn't stand alone, and we should look for free exchanges of water, whether paper exchanges, whatever. I don't know that we are in a position to look at the Susquehanna. It seems like that is out of the picture. But certainly there is no reason at all why the Delaware and Hudson River, if they are going to be utilized for water supply purposes, shouldn't be looked at together.

New York City, obviously one of the large takers of Delaware River water, could very easily be on the Hudson River in a supplemental way, and in fact eastern New Jersey then might benefit from the Hudson River developments, and in fact one of the corps programs which show large aqueducts almost going through New Jersey.

Senator BRADLEY. You mentioned that the Federal Government should encourage cooperation to develop this kind of interstate water supply sharing. Do you have any specific suggestions on how we can encourage cooperation?

Mr. GERBER. Well, sometimes people have to be addressed from a Dutch uncle standpoint to get their act together, but letting things drag out for years and years with indecision after indecision is no way to do it, and offering all the multitude of agencies of the Federal Government for the States to use in a kind of a guerrilla warfare scenario seems to be not the way for the Federal Government to act.

I think they ought to act in a more uniform and unified kind of fashion.

Senator BRADLEY. Do the other two panelists in one closing comment want to make any suggestions as to what we should do, that is, what the Federal Government role should be?

Mr. TOMPKINS. Well, I would just like to echo Bob's statement, that I think every water supply project should be self-supporting and supported by those that benefit from it. The Federal Government's role as I see it can be as a sponsor or a coordinator of these large regional projects that involve several States or several water purveyors that couldn't be funded alone, together with a means of financing using the tax-exempt status, a low interest bank, et cetera, to make funds available for these projects.

But it should be on payback as-needed basis so that you support the utility to pay it back, and in those large systems like Bob was referring to, there may be an interim period that it would have to be subsidized, to be paid back later, and I think that is more a sponsor role of the Federal Government or the State on smaller projects.

Mr. RICCI. I think one of the basic deficiencies in the Federal water policy is the fact that there is no coherent Federal water policy. And that includes the whole pricing. You heard testimony earlier about some of the delays, that signals were being changed. I agree that I think the users, the beneficiaries should pay for the full cost of the project. However, the Federal Government developing a policy for its major regional systems must recognize that we need up-front money to support unsold blocks of water until such time as someone does in fact benefit from it. We have that same problem, by the way, in our Manasquan project. The idea that we are promoting is that when later contracts are signed that those people will over an extended period of time pick up their full share of the capital costs.

Senator BRADLEY. Thank you very much for the testimony. I think it is very helpful, and I appreciate your taking the time to be here. The record, I think, is of great benefit to the entire committee.

Thank you very much.

The hearing is adjourned.

[Whereupon, at 1:07 p.m., the subcommittee was recessed, to reconvene, Wednesday, August 7, 1985, in Cherry Hill, NJ.]

# WATER SUPPLY ISSUES IN THE MIDDLE ATLANTIC STATES

---

## WEDNESDAY, AUGUST 7, 1985

U.S. SENATE,
SUBCOMMITTEE ON WATER AND POWER,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
*Cherry Hill, NJ.*

The subcommittee met, pursuant to notice, at 10:25 a.m., in the Council Chambers of the Municipal Building, 820 Mercer Street, Hon. Bill Bradley, presiding.

Present. Senator Bradley.

Also present: William B. Conway, counsel for the minority.

## OPENING STATEMENT OF HON. BILL BRADLEY, A U.S. SENATOR FROM THE STATE OF NEW JERSEY

Senator BRADLEY. The Subcommittee of the Energy Committee shall come to order. This is a hearing of the Subcommittee on Water and Power of the Energy and Natural Resource Committee of the U.S. Senate.

I would like to express appreciation to Mary Schneider, the clerk of Camden County, for the use of these council chambers. There is a sign-up sheet over next to the door for anyone that would like to receive a record of these proceedings. The record will remain open for another 2 weeks in case there are additional submissions of materials that anyone in the room believes would add to the hearing.

If there are additional submissions, they should be mailed to the Committee on Energy and Natural Resources, the Subcommittee on Water and Power, Senate Dirksen 358, in Washington, DC 20510.

If you need that address, you can get it from us later in the morning. I want to thank all of those who are attending today's hearing in which I hope we'll learn more about the water issues of importance to the mid-Atlantic region.

Our Nation has been divided historically into two water supply regions. Dry conditions prevail in our Western States, where the average rainfall is a mere 15 inches per year. As a result, these States have been forced to deal with the difficulties associated with consistently scarce water resources.

This is contrasted to the 45 inch annual rainfall enjoyed by the Eastern United States. In fact, the abundance of this resource has been an integral part of the development of our region. The result has been very different water management policies and even very different water supply psychologies.

The severe drought in the 1960's, as well as the past 5 years of on again, off again, drought warnings have increased public discussion of water supply issues in the Eastern United States. We who live in this region cannot take our plentiful water supplies for granted. An increasing amount of attention is being given to our Nation's emerging water supply crisis.

But we have to distinguish between the availability of usable water and the supply of the natural resources itself. I'll repeat that. We have to distinguish between the availability of usable water and the supply of the natural resource itself. Until that is done, the public is likely to believe that our water supplies are diminishing.

The fact is that we, as a Nation, consume only 7 percent of our renewable water supply. Under those conditions, I really question the use of the terminology water supply crisis. How can we reconcile the abundance of the natural resource with the obvious scarcity of available water? It is my belief that we are suffering the results of insufficient, long-range planning and management of water supplies.

Therefore, in order to meet our future needs, it's important for us to examine the issues more carefully, determine where the problems are, and develop long-range strategies.

This is the third in a series of three hearings on water issues in the mid-Atlantic region. The first hearing took place on July 22 in Washington, DC. At that time, we heard from those Federal agencies with primary responsibility for water supply issues in the United States. The U.S. Geological Water Survey is the Department of Interior's principal water information agency. It collects, evaluates, and disseminates data on all aspects of the Nation's water resources.

Dr. Dallas Peck, the Director of the USGS raised two very important points at our first hearing. First, there is more than ample rainfall, as I have said, to meet the demands of the mid-Atlantic region. The thrust of our efforts must therefore be directed at better water management.

Second, Dr. Peck informed us that the ground water available in the Pinelands region of New Jersey is substantially greater than the present surface water supplies in the State.

Additional testimony was provided by Brig. Gen. Paul Kavanaugh of the North Atlantic Division of the Army Corps of Engineers and by Mr. Richard Atwater, special assistant to the Commissioner of the Bureau of Reclamation. These two agencies, the corp and the Bureau of Reclamation, have primary Federal responsibility for the storage, transportation, and general utlization of water.

Mr. Atwater made it quite clear that their ground water experiences in the Western States are directly applicable to the Eastern United States. In addition, Mr. Atwater informed us of the ease with which present engineering and technology is able to move water over great distances, in some cases, as far as 500 miles. This has clear implications for interbasin connections in the East.

Brigadier General Kavanaugh made special mention of the need for a Hudson River project to meet water demands in the region. In fact, it was the opinion of the corps that if such action had been taken as recommended in the Northeastern water study, the so-called NEWS study, the difficulty presently encountered in New York City would not exist.

Brigadier General Kavanaugh also stressed the need for infrastructure improvements within the region.

Our final witness that day was Mr. John Gaston, director of New Jersey's Division of Water Resources. Mr. Gaston provided us with a comprehensive review of State action taken to meet both the present and long-range needs of New Jersey residents. This included the need for New Jersey to reach beyond its borders for sufficient water supplies after the year 2000.

Today, as we did yesterday, we will delve into non-Federal perspectives on these issues. We will hear testimony from State and local governments, citizens' groups, and water suppliers.

Let me emphasize that we are here to learn. I look forward to your reactions, to the issues raised in our Washington hearing, and I will also raise a number of questions that I hope we will explore today. For example: How do present water supplies compare with demand? What are the projections of future supply with demand? If supplies are predicted to be overstrained, should our priority be conservation programs or the development of new sources of water?

What steps can be taken to motivate consumers to conserve during both the dry and wet times? What are the most cost-effective types of water projects? Should we try to combine flood control projects with surface water storage for potable purposes? Should we emphasize interbasin connection, intrabasin connection, or point of use at the source?

Who should bear the costs of such projects? And, in general, what is the appropriate role for the Federal Government in water management?

I look forward to today's witnesses in hopes that they'll not give us answers to all the questions, but at least shed some important insight into them.

As I said at the outset, I believe that we are suffering the results of insufficient long-range planning and management of water supplies, and that's what I hope we'll be able to address in some detail in today's hearing.

Our first witness is Mr. Tim Weston, who is a commissioner of the Delaware River Basin Commission, and he is here with his testimony and has also brought the testimony of Mr. Gerald Hansler, executive director of the Delaware River Basin Commission.

Mr. Weston, welcome to the committee. Please feel free to read your statement. We try to move things along in the hearing so that we don't end up with interminable statements, but we want to have enough so that we can get a sense of your point of view, and then we'll ask some questions.

Welcome to the committee.

## STATEMENT OF R. TIMOTHY WESTON, COMMISSIONER, DELAWARE RIVER BASIN COMMISSION

Mr. WESTON. Thank you, Mr. Chairman.

Senator **Bradley**. Excuse me. If you hear a bell go off, that's the warning signal. But take at least 10 to 15 minutes to make your statement.

Mr. **Weston**. I will try to keep my remarks brief.

On behalf of the commissioners of the Delaware River Basin Commission, we appreciate this opportunity to appear before the subcommittee and provide background on our past, present, and future water supply programs in the Delaware River Basin.

In 1961, the Delaware River Basin Commission was founded by a compact among the four basin States and the U.S. Government. In the case of this compact, Congress did not merely ratify the agreement among the States, but joined the U.S. Government as an equal party. The purpose of the compact was to establish a forum or agency in which the five parties could jointly exercise their partnership, their respective powers in water resource management for the common interest of people in the region.

Certainly, one of the critical water resource considerations in this region is the provision of adequate water supplies related both to quantity and quality for both existing and future users.

Is there enough water in the basin to serve its present 22 million users, both in and out of the basin?

As you stated, Mr. Chairman, we in the East are blessed with bountiful rainfall. I should note, however, that the rainfall per person in the Delaware Basin is less than half the per capita rainfall of dry New Mexico, and our total water use in this basin exceeds the flow of the Colorado and Rio Grande combined. We are probably the most intensively developed and used water resource region in the country, and therefore have the greatest stake in wise water management.

The compact, when it was adopted in 1961 optimistically found that the water resources of the Delaware River Basin, if properly managed—excuse me—planned and utilized, are ample to meet all presently projected demands, including existing and added diversions in future years, and ever-increasing economies and efficiencies in the use and reuse of water resources can be brought about by comprehensive programming and management.

Despite the fact we are the most intensively used basin in the Nation, there remains today and probably for decades more to come, enough water to meet our present and future needs in the basin, provided that the management agencies can muster the financial, political, and public support to meet those needs.

The compact sets forth a number of specific mandates and authorities for DRBC in dealing with the provision of adequate water supply. They are the following:

The commission shall develop and effectuate plans and policies and projects for the use of water in the basin to meet a variety of needs.

Second, the commission shall adopt and promote uniform and coordinated policies for water conservation, controlled use, and management.

The commission is encouraged to encourage the planning, development, and financing for water resource projects and undertake development of those projects.

We are to formulate and adopt a comprehensive plan for the basin.

We are to formulate and adopt a program, a 6-year program on how to carry out that plan.

We have the authority to allocate water to and among our signatory parties and their political subdivisions in accordance with the doctrine of equitable apportionment.

And we are to review and approve any project having substantial effect on the water resources of the basin, including any project involving a new surface or ground water withdrawal.

Without giving a complete primer, let me note that DRBC has and continues to fulfill all of these obligations.

Our original comprehensive plan and the 1954 Supreme Court decree preceded it reflect the existence of a variety of water users, storage, and water quality improvement projects to protect existing and new users, uniform rules and regulations for new water allocations without regard to political boundary, and water conservation policies that apply basinwide.

However, much of our initial planning, and again, also the Supreme Court decree of 1954, were based on hydrologic conditions that were then of record as of 1964 and 1961. The drought of record of that time was the 1930's drought. In the mid-1960's another much more severe drought occurred in the basin and there wasn't enough water to meet the requirements under the decree of New York and New Jersey out-of-basin diversions, plus the reservoir releases required to meet minimum flow standards in the Delaware River main stem.

Another factor which dampened our ability to meet the water supply demands during the period of drought was the postponement of major water projects in the basin, including the Tocks Island Reservoir project in 1975. As a result in changes in environmental standards and perspectives, the Tocks Island project has, for all intents and purposes, been shelved. We had to go back to figure out how to rebalance the basin's supplies.

In the drought of the 1960's, we were able to maintain a minimum average flow of only 1,550 cubic feet a second. We have improved that capacity due to the development of Beltsville and Blue Marsh Reservoirs, and currently with the water conservation programs undertaken in the basin, cutbacks and diversion, and release operations during droughts, and wise management of our waters, we believe we can now maintain a flow of 2,500 cubic feet a second, a considerable improvement in our overall management of the past 20 years.

However, additional programs are needed because of the rising sea level and increasing degree of water use demand in the basin. With the postponement of the Tocks Island project, the DRBC embarked on a mid-course correction of its comprehensive plan through what was known as a level B study process.

In that process, we looked at our present and future water supply needs to the year 2000, and the plan that was ultimately adopted by the Commission in July of 1981 recommended a series of actions which included, first, water conservation; second, revision of the 1954 Supreme Court decree relative to out-of-basin diversions and releases in time of drought; third, operation of all basin storage reservoirs as a system during periods of drought; fourth, revision of our estuary chloride standard to protect salt water intrusions; next, studies by New York and New Jersey of major local water supply problems, some of which you have already testified to by Mr. Gaston; and finally, the development of new or increased water supply storage in five separate reservoir projects which I'll come back to later.

We have appended to our testimony the level B study which gives a great deal of background about this basin and its future.[1] However, before most of these recommendations could be placed in our comprehensive plan, it was a requirement that all parties to the Supreme Court decree of 1954 concur. Based upon a formal DRBC resolution, the basin States and the city of New York undertook what was known as the Goof Faith negotiations. After roughly 4 years of negotiation, which I must note as a negotiator were arduous indeed, we finally arrived at a document which was signed by the Governors and mayor of the city of New York in 1983, entitled "Interstate Water Management Recommendations of the Parties to the U.S. Supreme Court Decree." We know it by its short term, "Good Faith Agreement."

The Good Faith Agreement paralleled the level B study recommendations and included the following elements:

DRBC should base its planning for dependable water supplies on the drought of record, not a lesser drought not yet experienced that might be more severe.

Second, that the Commission would revise its estuary salinity standard in order to protect the Camden area groundwater from permanent and harmful levels of sodium contamination resulting from infiltration of salt water in the Delaware estuary, but recognizing also the realities of today's basin storage and its capacity to meet flow augmentation to repel salinity.

Next, that specific criteria should be established to identify the onset and stages of the drought in order to trigger water conservation actions by DRBC and signatory parties in the city of New York.

The decree diversion/release requirements would be revised based upon the drought period storage and that the actual location of the salt front in the estuary would go in the operation of all of our reservoirs.

We also agree that there will be developed a coordinated plan for operating all of our reservoirs as a system. That includes reservoirs that are privately held, Federal reservoirs, and State reservoirs, all under a common operating plan.

I must note, Mr. Chairman, that this is one of the few regions in the country that has such a coordinated operating plan under one system. Each State was required to prepare and has submitted to the Commission contingency plans for drought conservation measures, and in fact we are now following them in this current drought.

The Commission was ordered to develop a regulatory mechanism to control future depletive uses, what we know as the depletive water use budget. And that budget will govern existing new and expanded uses in the basin so as to assure we will not exceed our reliable supply.

---

[1] The study was retained in subcommittee files.

Finally, the Good Faith Agreement recommended early action on a number, on a series of additional reservoir storage projects, relatively modest in size I should note by most standards. These included the Francis E. Walter Reservoir modification in Pennsylvania, a Corps of Engineers project; Prompton Reservoir, another Pennsylvania project owned by the Corps of Engineers; Merrill Creek Reservoir in New Jersey, to be developed by Basin Electric Utilities; and the Cannonsville Reservoir modification, a New York City Reservoir which will be raised by the State of New York for additional supply.

The proposed Hackettstown project, which was originally to be developed in the State of New Jersey was dropped from our consideration due to engineering problems with its foundation.

So basically, we're looking between now and the year 2000 to four major reservoir projects in the basin. The level B study report and the Good Faith Agreement were only a beginning, but we have moved to implement those recommendations. Eight of the 14 Good Faith recommendations have been implemented and the remaining six are in various stages of completion.

But the focus on the point for this committee insofar as Federal involvement in the implmentation of our programs, there are two key concerns. First, an equitable Federal/DRBC cost-sharing package must be developed for the Francis E. Walter and Prompton Reservoir modification projects which reflects both past Federal promises, current administration policies, and consistent equitable treatment of Western and Eastern interests.

Second, in order to finance basin projects, consideration must be given to modification of section 15.1B in the Federal reservations to the compact which currently grandfather precompact water uses from being subject to DRBC water use charges.

Let's consider first the cost-sharing issue. Modification of the Francis E. Walter project to include storage for water supplies as authorized by Congress in 1962 called for a Federal/DRBC cost-sharing split of 32 percent for the Federal Government and roughly 68 percent of the basin States in the DRBC. That split did not include the consideration of the fact that a major portion of the water supply storage is to be devoted for flow augmentation to repel salinity in the estuary.

Under current Federal law, that particular element could be funded 100 percent by the Federal Government. However, if DRBC and the basin States were to pursue that tack, it would be necessary for Congress to authorize a new project purpose and considerable delays would occur in reformulating the project.

Therefore, we are not pressing that issue based on present Corps of Engineer and Federal administration's cost-sharing proposals. The $112.8 million cost of modifying the Walter water project to provide water supply storage, plus enhanced recreation and some modest additional flood control would be allocated, 11 percent to the Federal Government and 88 percent to the basin State acting through DRBC, a considerable increase in the share that must be borne by non-Federal agencies.

The project has not been changed. The cost share has. The DRBC and Basin States recognize and are sensitive to the Federal deficit problems, and we have supported adoption of uniform Federal cost-sharing policies to equitably treat all areas and regions in the country under common and consistent rules.

We are currently exploring with the corps the main issue that remains on the table within our contracts for Walter, which is the method by which we allocate project costs among water supply, flood control, and recreation. We are hopeful that at the conclusion of those negotiations, we will have a package that we can move forward and will receive the support of Congress in getting this project, this much-needed project built.

Finally, we have to consider how do we pay for the two necessary projects—Walter and Prompton? The combined non-Federal cost of these two projects is $130 to $160 million, the bulk of which will be borne by the non-Federal interests. The DRBC Commissoners have considered a number of methods to finance these projects.

First was to obtain capital contributions from each of those down-basin States—Pennsylvania, Jersey, and Delaware. The second was to sell DRBC bonds, backed by periodic State appropriations out of their general fund revenues. The third was to increase water charges levied against postcompact service water users in order to retire DRBC revenue bonds. There are approximately 20 of those postcompact users who are now subject to charge.

And finally, to increase the number of water users in the basin who would pay water charges by modifying section 15.1(b) of the Federal reservations to the compact in order to establish a more reliable and broad-based revenue stream in order to repay DRBC revenue bonds.

I should note that the Federal Government, Congress, when it adopted the compact, added its own reservation which limited the authority that otherwise existed in the compact to charge all basin water users with the benefits of projects. Congress, not the States, in their adoption of the compact, exempted all precompact users from any charges, regardless of their past use or the benefits they received from the project.

The question before us is whether this is fair and equitable in the future. Of the methods considered for financing the Walter and Prompton projects expanding our water sales base by modifying that Federal reservation seems the best avenue at this point in time.

The Commission has distributed a white paper for public comment back in March of this year, and public briefings were held in each basin State to air this issue. A cross-section of views was obtained and, as you would expect, they range from strong support to disfavor.

I believe DRBC will further consider this method of financing and will make a recommendation to Congress regarding the method that we believe is fairest to carry out our obligations under the Walter and Prompton modification program.

We are prepared to do our part with our Federal partners to finance these projects. We hope and trust that the Federal Government is prepared to do its part as well. If and when the Commission finally decides to request congressional action in modifying section 15.1(b), the support of your subcommittee and you, Mr. Chairman, as well as the entire basin delegation to Congress will be very much appreciated and badly needed.

Finally, let me state and restate that if we develop and manager our waters wisely, we do have ample water reserve in this basin to meet all legitimate uses, both now and for the likely foreseeable future. We must take care of our waters and manage them with responsibility, but we can move forward as partners to make this basin a model for this country.

[The prepared statement of Mr. Weston follows:]

# WATER SUPPLY PLANS, PROJECTS AND PROGRAMS
# FOR
# THE DELAWARE RIVER BASIN

Statement by R. Timothy Weston, Commissioner, Delaware River Basin Commission, for the record for the United States Senate Committee on Energy and Natural Resources, Subcommittee on Water and Power, Hearing in Cherry Hill, New Jersey, August 7, 1985

Mr. Chairman: The Delaware River Basin Commission appreciates this opportunity to provide the Subcommittee with past, present and future water supply programs in the Delaware River Basin.

In 1961, our Delaware River Basin Commission (DRBC) was founded by Compact among the four Basin States of Delaware, New Jersey, New York, Pennsylvania and the United States. In the case of this Compact, Congress did not merely ratify an agreement among states, but joined the United States Government as an equal party. The purpose of the Compact was to establish a forum or agency in which the five parties could jointly exercise their sovereign powers in water resource management for the common interest of all people in the region who use our wonderful water and related land resources.

One of the major water resource considerations is that dealing with the provision of adequate water supplies -- related to quantity and quality for both existing and future users. Is there enough water in the Basin to serve its present 22 million users - both in and out of the Basin? The Compact, in Section 1.3 found:

> "(d) The water resources of the Delaware River Basin, if properly planned and utilized, are ample to meet all presently projected demands, including existing and added diversions in future years and ever increasing economies and efficiencies in the use and reuse of water resources can be brought about by comprehensive planning, programming and management."

There remains today and for decades to come more than enough water to meet present and future needs in the Basin -- provided the management agencies can muster the financial, political and public support to meet those needs.

The Compact sets forth specific mandates and authorities for the DRBC in dealing with the provision of adequate water supplies. The DRBC:

- Shall develop and effectuate plans, policies, and projects for the use of water of the Basin for domestic, municipal agricultural and industrial water supply.
- Shall adopt and promote uniform and coordinated policies for water conservation, control, use and management in the Basin.
- Shall encourage the planning, development and financing of water resources projects according to such plans and policies.
- Shall formulate and adopt a comprehensive plan for the immediate and long-range development and uses of water resources of the Basin.
- Shall formulate and adopt annually a Water Resources Program to carry out the Comprehensive Plan, based upon a six-year horizon.
- Shall have the power to allocate the waters of the Basin to and among the states signatory to the Compact and their political subdivisions, based upon the doctrine of equitable apportionment. (An exception is that the DRBC may not impair, diminish, or otherwise adversely affect the diversions, compensating releases, rights, conditions, and obligations of the parties to the 1954 U. S. Supreme Court Decree, which partially apportioned the waters of the Delaware, without the unanimous consent of the parties to the decree and after consulting with the decree-authorized River Master).
- Shall review and approve any project having a substantial effect on the water resources of the Basin (including new surface and ground water withdrawal projects).

Without giving a complete primer, the DRBC has done and continues to do all of the above.

Our original Comprehensive Plan and frequent amendments to that plan reflect the existence of present water supply users, storage and water quality improvement projects to protect existing and new users, uniform rules and regulations for new water allocations without regard to political boundary, and water conservation policies that apply Basinwide.

However, much of our initial planning and strategies were based upon hydrologic conditions of the then drought of record — that of the 1930s. In the mid-1960s, another and more severe drought occurred and there wasn't enough water to meet the requirements of New York and New Jersey out-of-basin diversions and the reservoir releases requirements to meet minimum flow targets on the Delaware main stem.

Another factor which dampened our ability to meet water supply demands during periods of drought was the postponement of the Tocks Island project in 1975. The minimum average monthly flow in the Delaware during the drought of the 1960s was 1,550 cfs. Today, with our increased upstream storage capacity and revised drought diversion/release operations, we think that it's possible to maintain a minimum monthly average flow at Trenton, which is head of tide, of 2,500 cfs. However, additional programs are needed because of a rising sea level and ever-increasing depletive water use demand.

With the postponement of the Tocks Island project in the mid-1970s, the DRBC embarked upon a mid-course correction of its Comprehensive Plan through a "Level B Study process" partially supported by a Water Resources Council grant, To meet our present and future water supply needs to the year 2000, the Level B Study Report, accepted by the Commission on July 22, 1981, recommended a set of alternatives which included:

- Water conservation.
- Revision of the 1954 U. S. Supreme Court Decree relative to diversions/releases in times of drought.
- Operation of all basin storage reservoirs as a system during periods of drought.
- Revision of the estuary chloride standard.
- Studies by New York and New Jersey on some major local water supply problems.
- The development of new or increased water supply storage in five separate reservoir projects — F. E. Walter (Corps), Prompton (Corps), Cannonsville (New York State), Merrill Creek (the Basin's electric utilities), and Hackettstown (State of New Jersey).

A copy of the Level B Report is submitted for the record.

However, before most of the above recommendations could be placed into our Comprehensive Plan, there was the requirement of concurrence by parties to the 1954 U. S. Supreme Court Decree (DECREE). Based upon a formal DRBC resolution, a "Good Faith" negotiating process was intiated among the parties to the Decree — Delaware, New Jersey, New York, Pennsylvania and New York City. These negotiations produced a document entitled "Interstate Water Management Recommendations of the Parties to the U. S. Supreme Court Decree of 1954 to the Delaware River Basin Commission Pursuant to Commission Resolution 78-20." The 14 recommendations contained therein were unanimously agreed to by all five parties to the Decree, four of whom were also Members of the Commission:

Delaware - Governor Pierre S. du Pont, IV
New Jersey - Governor Thomas H. Kean
New York - Governor Mario M. Cuomo
Pennsylvania - Governor Dick Thornburgh
New York City - Mayor Edward I. Koch

A copy of that document, also known as the "Good Faith" agreement, is offered for the record.

The "Good Faith" agreement parallaled the Level B Study Report recommendations and included the following elements:

- The DRBC should base its planning on dependable water supplies on the drought of record — not a lesser or yet to be experienced more severe drought.
- The estuary salinity standard should be modified to protect Camden area groundwater water supplies from permanent and harmful levels of sodium contamination, recognizing the realities of today's basin storage for flow augmentation to repel salinity.
- Specific criteria should be established to identify the onset and states of a drought which could trigger water conservation actions by DRBC, its signatory parties and New York City.
- The DECREE diversion/release requirements should be revised based upon the drought period storage criteria and actual location of the salt front location in the estuary.
- There should be developed a coordinated plan for management of other major basin reservoirs — state, federal, and electric utility — under DRBC's emergency authority set forth in the Compact.

- Each state should prepare and submit to the DRBC comparable contingency plans which would become operable based on DRBC declared drought warning and emergency actions.
- The DRBC should develop a regulatory mechanism to control every-expanding depletive water uses, so that essential existing, new and expanded uses would not be curtailed during drought periods and be in balance with available storage necessary to meet salinity objectives.
- And finally the "Good Faith" agreement recommended early action to develop a modest amount of additional reservoir storage at the F. E. Walter, Prompton, Merrill Creek, and Cannonsville reservoirs. (The proposed Hackettstown project, described in the Level B Study to be built by New Jersey was dropped from consideration for engineering reasons related to foundation geology.)

The Level B Study Report and the "Good Faith" agreement were only a beginning. Eight of the 14 "Good Faith" recommendations have been implemented, and the remaining six are in various stages of completion. Extremely important, insofar as federal involvement in their implementation, are two key factors:

- an equitable Federal/DRBC cost-sharing package which reflects past federal promises, current Administration policies, and equity between Western and Eastern agricultural interests; and
- modification of Section 15.1(b) in the Federal Reservations of the Compact, which relates to classes of users in the Basin not now subject to our water use charges.

Let's consider the Federal/DRBC or local cost-sharing issue first.

Modification of the F.E. Walter project to include storage for water supplies, as now authorized, has a Federal/DRBC split of:

| | |
|---|---|
| Federal Government - | 32.2% |
| DRBC - | 67.8% |
| Total | 100.0% |

This does not include water supply storage for flow augmentation to repel salinity in the estuary. Under current federal law, that could be 100% federal funding. However, if the DRBC and Basin States were to pursue that tack, it would be necessary for Congress to authorize the new project purpose, considerable delays could occur in reformulating the project.

Based upon the present Corps of Engineers' and Federal Administration's new cost-sharing proposals, the $112.8 million cost of modifying the F. E. Walter project to provide water-supply storage and enhanced recreation and flood control would be allocated as follows:

| | |
|---|---|
| Federal Government - | 11.5% |
| DRBC ( & local) | 88.5% |
| Total | 100.0% |

The Basin States and DRBC recognize and are sensitive to the federal deficit problems. We have supported adoption of uniform Federal cost-sharing policies which equitably treat all areas and regions of the country, under common and consistent rules.

Presently, we are in the process of final negotiations with the Corps on cost-sharing for the F. E. Walter Project. An important factor in arriving at an equitable cost-sharing arrangement with the Corps is the type of Separable Cost-Remaining Benefits methodology (SCRUB) to be used by the Corps in allocating project costs among water supply, flood control and recreation for that project. Hopefully, final estimated construction cost figures based upon a fair and equitable allocation of project purposes can be agreed to in the near future.

Finally, how do we pay for these two necessary projects -- F. E. Walter and Prompton? The combined non-federal cost of the two could be in the $130 to $160 million range. The DRBC Commissioners have considered various methods to finance them:

- Obtain up-front capital from each of the three down-basin states.
- Sell DRBC bonds backed up by periodic state capital contributions to repay the bonds.
- Increase the water charges levied against post-Compact surface water users to retire DRBC revenue bonds.
- Increase the number of water users which would pay a water charge by modifying Section 15.1(b) of the Compact, thereby establishing a more reliable and broad-based revenue stream to repay principal, interest and associated project costs.

Of the methods considered, expanding our water sales base by modification of Section 15.1(b) seems the best avenue at this point in time. A white paper (copy submitted for the record) on this concept was publicly distributed in March of this year. Public briefings were held in each Basin State to further air the matter.

A cross-section of views was obtained regarding the concept of modifying Section 15.1(b), and as one would expect, they ranged from strong support to disfavor. I believe that the DRBC will further consider this method of financing the non-federal share of the F. E. Walter and Prompton modifications. We are prepared to do our part with our Federal partner to finance these projects.

If and when the Commission formally decides to request Congressional action in modifying Section 15.1(b), the support of your subcommittee, and the entire basin delegation and Congress will be very much appreciated.

Yes, we do have an ample water reserve in the Delaware Basin for all legitimate uses, now and for a lengthy forseeseeable future. But, it is of paramount importance that fair and equitable arrangements to share the costs of establishing our basic needs be developed. And, that should not entirely exempt one of the five equal parties to the DRBC -- the United States Government.

Thank you for this opportunity. I would be glad to respond to any questions, in writing, that you may ask as a result of this presentation.

# # #

Senator **Bradley**. Thank you very much, Mr. Weston, for your testimony. It was to the point. I think it's very helpful and the committee will benefit from the record that you have made with your statement.

I'd like to deal with some general questions and then get to some specific questions, just for the purpose of the record.

What would you say are the major advantages to centralized regional planning within a river basin?

Mr. **Weston**. Well, in a basin that shares its water supply and watershed with four States, it was very difficult for any one of the States to take action without affecting their neighbors. Prior to the company in 1961, this basin engaged in a series of lawsuits and trying to manage water through the justices of the Supreme Court is awkward and not very satisfactory.

After the compact, we finally had a forum where we could talk to each other, have a neutral staff that could give advice to all of the parties, and getting an ongoing base for reaching the type of compromises that are needed when you share a supply.

I think the best example of that that I can personally relate is what occurred during the 1980's drought. In the 1960's when the drought occurred, the States nearly returned to the Supreme Court, unable to at that point reach an agreement, 1½ years after the compact had gone into effect.

By the 1980's drought, we had a plan in hand that said what we should do at various stages, and although it was politically difficult for the Governors and mayor of the city of New York to go out and ask for a rationing or ask for water use conservation measures, the mayor of the city of New York and the four Governors gathered together and simultaneously took the actions that were needed to balance the basin's supplies.

It allows for mutual commitments to be made. It allows for projects to be located in one State to benefit many States. For example, the Walter project, which is located in the State of Pennsylvania, will help not only Pennsylvania users but also New Jersey users. I'm sure that New Jersey will pay its appropriate share. It allows us to share those resources on a much more reasonable fashion.

Senator **Bradley**. How does the Commission makes it decisions? How does the Commission decide what project to go ahead with and what to hold back on?

Mr. **Weston**. Well, the Commission's formal decisionmaking mechanism, the Commission is formed of the Governors of the four basin States, plus the Secretary of the Interior, each one with an alternate. A majority vote of the Commission is binding upon all the parties, including the Federal Government, and the Federal Government's member happens to vote yes, it's binding on all members of the Commission.

Senator **Bradley**. How many members of the Commission are there?

Mr. **Weston**. There are five. Five members.

Senator **Bradley**. I think the record should reflect where they're from.

Mr. **Weston**. The five members are from New Jersey, Delaware, Pennsylvania, the State of New York, plus the Federal Government.

Senator **Bradley**. Who is the Federal Government's representative?

Mr. **Weston**. The Secretary of the Interior.

Or his alternates appointed by the President.

Senator **Bradley**. And decisions are made on majority vote?

Mr. **Weston**. On a majority vote.

Now, there is one exception to that. The one exception is any change to the Supreme Court decree of 1954 must be by unanimous consent of the parties to that decree. None of the parties to the decree is not a party to the Commission; that is, the city of New York. So all of the actions that were taken during the droughts involving changes in diversion rights and leases also included the consent of the city of New York.

Senator **Bradley**. How many votes have there been in the last year?

Mr. **Weston**. Oh, I would say probably several hundred.

Senator **Bradley**. Are the votes usually unanimous or are they close?

Mr. **Weston**. I can think of only two votes that were—three votes that were not unanimous.

Senator **Bradley**. And what were those votes?

Mr. **Weston**. They were three requests for Federal grants in which the Federal member dissented.

Senator **Bradley**. The Federal Government dissented.

Mr. **Weston**. Yes, the Federal Government.

Senator **Bradley**. Well, I'm glad to see consensus is alive and well in the Commission's function.

With this success record, what do you think of the interbasin coordination? We have regional water needs and you, of course, deal with the Delaware River basin. There's also the Hudson River and the Susquehanna nearby.

The question is, what are your thoughts on interbasin coordination?

Mr. **Weston**. Well, let me point out I also have the distinction of serving as a commissioner on the Susquehanna River Basin Commission and the Ohio River Commission and the Great Lakes Commission, so I think I have a lot——

Senator **Bradley**. You serve on a lot of corporate boards or the equivalent thereof.

Mr. **Weston**. The two Compact Commissions, the Susquehanna and the Delaware, are fairly well coordinated. We not only exchange data, but because we share several commissioners and several States in common, we work pretty closely together in our planning and in fact there are transfers of water from the Susquehanna basin to the Delaware basin serving the city of Chester, and there are several applications pending by Delaware suburban systems to interconnect with the Susquehanna, and those are coordinated between the two commissions.

I think having the two commissions makes that coordination a lot easier. Because the city of New York and the State of New York are very active participants in the discussions in this Commission, the work that occurs on the Hudson is at least coordinated with this Commission. We are not direct participants in much of the Hudson work, but of course the Hudson does not have its own coordination mechanism similar to ours. It is far less organized.

We have been in fairly close contact with our other basins out on the western side of my State, in the Ohio and Great Lakes, but transfers between those basins are not being planned.

Senator BRADLEY. Do you think there's a Federal role in promoting interbasin coordination?

Mr. WESTON. Yes; I do. I participated in some of the early work to try and improve the water resources planning process that occurred under the U.S. Water Resouces Council. And one of the main purposes of the Water Resources Planning Act back in 1965 was to try to bring the basins together.

Unfortunately, those mechanisms have all but dissolved because the Federal Government has walked away from the regional systems and from coordinating regional systems. It has been left to the States to keep it going. I'm happy to say, at least in the East, they have kept the lines of communication open, but there is work still to be done, both in terms of research and planning and also to keep the forums working, to get people talking.

Senator BRADLEY. In your testimony, you refer to the Good Faith Agreement of 1983 and you enumerate various aspects of that agreement. Specifically, you stated that the decree diversion/release requirements should be revised based upon the drought and storage criteria and actual location of the salt front.

What's the process for that revision?

Mr. WESTON. We are also submitting for your review the entire agreement, but let me explain briefly.[1]

There is a specific chart of storage levels in the New York City Reservoirs based on season, and since the city reservoirs represent 90 percent of the storage now available in the basin, it is a pretty good idea of how our water supplies are doing at any time of the year. When the storage in the New York City Reservoirs falls below a certain point, we automatically declare a drought warning.

If they continue to fall below another point, we declare a drought emergency. At each of those stages, there are mandatory pre-agreed-upon cutbacks in diversions by New York City and New Jersey. The final stage is a 35-percent cut in diversion rights.

At the same time, the release schedule to maintain flows at Wanaque, which is the tristate border at Trenton are accordingly cut back and geared to where the salt front is located. All these schedules and formulas are explicitly spelled out and agreed to.

Senator BRADLEY. Are they timed to coincide with a cutback to more intense conservation measures? And how is that link established?

Mr. WESTON. At the same stages, at warning stage there is an issuance of a request by all the States and by the Commission for voluntary conservation measures, and there is an enumeration of those conservation measures to be undertaken.

---

[1] The "Good Faith" Agreement was retained in subcommittee files.

At the drought emergency stage, all of the States are obligated to carry out their contingency plans for mandatory water use restrictions, nonessential water use restrictions in the basin.

The goals of those restrictions is a 15 percent cut in water use over what would otherwise occur during normal periods.

Senator **Bradley**. The USGS, reported that on July 29 the reservoirs in the Basin were at about 55 percent, whereas the normal level at this time should be 90 percent.

Mr. **Weston**. That's correct.

Senator **Bradley**. Which means that there is a rather dangerous period that we're entering into in August. Now, have we implemented the maximum amount of conservation measures up to this point? If things get worse, can we do even more? And, if so, what?

Mr. **Weston**. Let me give you a brief history of this drought. Back in January, the Commission declared a drought warning and the New York City diversions were cut back to 580—excuse me—680 million gallons a day. They were cut back in a second stage, back to——

Senator **Bradley**. From what level?

Mr. **Weston**. From 800 million gallons a day to 680 million, then 560 million in the second stage, and they're now down to 540 million gallons a day.

By the same percentages, the New Jersey diversions have been cut back, and the release rates have been changed. We undertook a drought emergency in this basin in May. It was passed by the Commission unanimously, actually in advance of the reservoir storage levels falling to emergency level. And, thus far, out of the conservation measures we've taken, we have realized 40 billion gallons of savings in those reservoirs.

Senator **Bradley**. What percentage of storage is that?

Mr. **Weston**. Right now, we have 146—147 billion gallons in the reservoirs, and 64 percent. It would be 100 million gallons, roughly, in the reservoirs. That would be—what—45 percent? So we have considerably saved water by taking actions early in this drought.

Senator **Bradley**. What specific actions have you not taken that you could take? That was my question.

Mr. **Weston**. Well, the next stage of a drought emergency in all four of the States is a further cutback in diversions and release rates. And we also have the contingency of ordering percentage cutbacks, rationing on all of our users. And we have thus far only done nonessential water use restrictions through the basin that is, lawn watering, car washing, filling swimming pools.

Senator **Bradley**. How are those enforced?

Mr. **Weston**. Each of the States has regulations which are in place and local governments are authorized to enforce them. In my particular State, it's a State law subject to a $500 fine or 60 days in jail.

Senator **Bradley**. And how many violators have been identified since May?

Mr. **Weston**. I don't have a figure back from the police. We know that we have had several prosecutions at an eastern part of the State, but we don't have the reporting mechanism. If I could turn to Bob Godell, our chief engineer, New Jersey does have a reporting system.

Mr. **Godell.** I don't believe there have been very many citations, although there have been warnings. There haven't been any citations.

Senator **Bradley.** But the result of the effort has been proven by virtue of water use for the July period as it compares to previous years. Therefore, you feel that the measures have proven to be effective?

Mr. **Weston.** Yes.

Senator **Bradley.** What is the cutback in usage for July, just ended, versus the normal July, on the average?

Mr. **Weston.** Speaking for Pennsylvania, our survey last week of our water systems indicated between an 8 and 10 percent cutback as a result of these restrictions, compared to a year ago.

Senator **Bradley.** Now, another point you make is that each State should prepare and submit to the DRBC comparable contingency plans which would become operable based on declared drought warnings.

Mr. **Weston.** That's what we're now following.

Senator **Bradley.** Next, DRBC should develop a regulatory mechanism to control energy-expanding depletive water uses so that essential existing, new, and expanded uses would not be curtailed.

Now, this means if I want to start—to take an extreme example—a coal slurry pipeline and I need to use a lot of water, I have to get approval from the Commission before I can do that?

Mr. **Weston.** Yes. As of now, since 1961, you would have been required to get approval from the Commission.

Senator **Bradley.** If I want to open a small business that uses water, do I have to get approval from the Commission?

Mr. **Weston.** If you use more than 100,000 gallons a day in any 30-day period, you must have a permit from the Commission.

Senator **Bradley.** How many permits have been issued?

Mr. **Weston.** We deal with roughly 10 to 30 of these a month. Of various types of projects, and I would say of those, maybe five or six of them are water allocation. I would say we have roughly, from the groundwater area, probably about 1,500 outstanding?

Senator **Bradley.** Have all requests been approved?

Mr. **Weston.** No, we have disapproved several.

Senator **Bradley.** On what grounds?

Mr. **Weston.** In southeastern Pennsylvania, where we have groundwater overdraft problems, we've turned them down as not enough water being available in the basins when they requested it.

In the surface water field, I can only think of one that was recently turned down. It was a request by an electric utility to use one of our reservoirs during this drought.

Senator **Bradley.** And these permits are approved or disapproved by the staff of the Commission?

Mr. **Weston.** No; they are voted on by the full Commission.

Senator **Bradley.** And they've been unanimous votes? Sounds like a good staff to me.

Mr. **Weston.** I must say not without a lot of jawboning by the Commission. The Commissioners at the meetings quite often overrule some of the staff recommendations and add a lot of conditions.

Senator **Bradley**. Now, you say the level B study report and good faith agreement were only a beginning. And now we get to the Federal involvement.

What Federal promises were you referring to with respect to cost sharing?

Mr. **Weston**. Specifically, Mr. Chairman, in 1962, when the Francis E. Walter project was approved by Congress, there were commitments made regarding how that project fit within the overall basin system and the cost-share, which was done by allocating project purposes, was set forth in the congressional authorization docket.

The administration used that as a minimum and has adopted their own procedure for reallocating those costs, which is now the subject of our discussion with the administration on how those costs should be allocated between recreation, water supply, and flood control.

Senator **Bradley**. And what is the essence of that discussion?

Mr. **Weston**. At this point, it's boiled down to a fairly complicated formula for separating the costs for flood control which is an existing project purpose. This is a project to be raised on the existing dams. Some of the facilities of that project—new spillway, new control tower—could be allocated in part to flood control.

They are, according to the Federal administration's policy, going to be totally borne by the water supply users, and the differences are $10 to $15 million, roughly, one way or the other.

I must say that Secretary Dawson, on another issue of administration policy, has granted an exemption from the new administration policy of charging us for past investments the Federal Government has in this particular project.

Senator **Bradley**. How has the price of water changed in the region over the past decade?

Mr. **Weston**. If you're talking about public water supply systems, which is where we have a pretty good handle, it's probably gone up by roughly 50 to 60 percent in my State, depending on the water supply improvements.

Those down in southeastern Pennsylvania that have had to undertake fairly substantial improvements have seen very large increases in their water rates. Part of that is difficult to parse out, though, however, because some of those systems are also charging for sewage capacity in the same water charges.

Senator **Bradley**. Are the charges set by the individual systems?

Mr. **Weston**. Yes.

Now, let me turn to the Commission's projects, because that's sort of the raw water charge in this basin. Currently our water use rates for users withdrawing from the basin is 6 mils per thousand gallons for nonconsumptive use and 6 cents per thousand gallons for consumptive water use.

Senator **Bradley**. Excuse me. What is meant by 6 mils for nonconsumptive?

Mr. **Weston**. Nonconsumptive use. That is water that's taken out and put right back in the river. And 100 times that rate for consumptive use.

If we look at the Francis Walter project in terms of cost per unit of water and price out the cost-sharing that's now being talked about, we're talking about those water rates going up anywhere from three to seven times.

Senator BRADLEY. So it would be 18 cents minimum. What is your estimate on the effect that will have on consumption?

Mr. WESTON. Well, this particular part of the rate is very small compared to an average water rate. For example, a person in the city of Philadelphia would see their water bill go up something like 30 cents a year. And it's not likely you're going to see that in your water bills.

For some consumptive water users which do get charged the higher rate, it will tend to move those industries toward more nonconsumptive use. Their other costs, however, including the costs of pollution treatment that have already moved them in that direction, and their ability to change much more of their technologies and reduce that consumption, are somewhat limited.

There are a few fields where they can.

Senator BRADLEY. If you added the total capacity of Walter, Prompton, Merrill Creek, and Cannonsville, how would it compare to Tocks Island?

Mr. WESTON. Less than one-half of the total capacity of Tocks.

Senator BRADLEY. Thank you very much, Mr. Weston, for your testimony.

Mr. WESTON. Thank you, Mr. Chairman.

Senator BRADLEY. Our next witness is Mr. Bruce Stewart, Water Resources Association of the Delaware River Basin.

Mr. Stewart, what we will try to do is to keep your prepared written official testimony between 10 and 15 minutes, and then we'll ask questions. If you hear a bell ring, don't be concerned. That's just a warning.

## STATEMENT OF BRUCE E. STEWART, EXECUTIVE DIRECTOR, WATER RESOURCES ASSOCIATION OF THE DELAWARE RIVER BASIN

Mr. STEWART. Mr. Chairman, members of the committee, my name is Bruce Stewart. I'm executive director of the Water Resources Association of the Delaware River basin. The association is a nonprofit and nonpartisan, technically oriented conservation organization. Our job is to serve as an adviser, advocate and watchdog over the waters of the four State Delaware River basin and to offer constructive commentary, as appropriate, on water resources issues.

WRA has a broad membership base, including individuals, civic groups, farmers, businesses, water suppliers, and major industries located throughout the basin.

In my remarks today, I would like to point out and illustrate what we believe are four serious problems in the Delaware River basin that need to be remedied. These problems may all be expressed as needs. There is the need for long-range planning. There is a need for sound management of our water resources, rather than management of what seem to be annual droughts. There is a need for a national water policy. And there is a need to understand the importance of water to businesses and industries which form the basis of our economy.

The Delaware River basin is not a drought-stricken area, as our advertising would lead people to believe, but rather, it is a water-rich area that receives an average of 44 inches of rainfall per year. Clearly, our problem is not one of a lack of water, but is one of a lack of storage and distribution facilities.

We seem unable to bring water to the people and this raises the question, with no levity in mind, of who's minding the storage.

During the past 10 years, it has become increasingly apparent that the water supply system of the Delaware River basin is inadequate to meet present needs, let alone future demands. There are some highlights from recent years that reflect the seriousness of the problem. During the 1980–82 drought, many Pennsylvania municipalities were rationed down to 25 gallons per person per day. Some reservoirs ran dry. Over 4,500 new wells were drilled as a result of the drought. Serious fires occurred. In some cases, fire companies were told to find other sources of water.

Newark, NJ was reported to be within days of being out of water. The Hackensack Water Co. reported 800,000 people in jeopardy with just 25 days of supply left. An emergency pipeline was laid across the George Washington Bridge to bring water into northern New Jersey.

In 1983, a year with 55 inches of rain, we saw a drought that caused over $80 million worth of damage to farmers in the Delaware River basin. And this year, 1985, is the 4th year out of the last 5, in which the Delaware River basin has found itself in drought status.

In northern New Jersey, water in 93 municipalities was rationed. There are general bans on nonessential uses of water and calls for water conservation programs throughout the Delaware basin.

The thread that links these problems is the need for sound and solid long-range water resource planning. We believe all of the problems just mentioned could have been avoided if the responsible agencies in the basin had had the foresight to develop genuine long-range plans and the means by which to implement them.

At present, the level B study for the Delaware River basin and the companion, the good faith agreement, both of which were developed over a period of approximately 7 years look no farther to the future than the year 2000. At one time, that target seemed like years away. Mathematically, it is 15.

The association's contention is that long-range planning should span at least 50 years in view of the lead time required for the development of water resources projects. For example, the Wanaque South project in northern New Jersey, which has just begun, is the result of 30 years of hard work and a great deal of cooperation among the sponsoring agencies.

Another example is the Point Pleasant project in southeastern Pennsylvania, a small pumping station on the Delaware River has been in the planning stages for 13 years and in the courts for 5. In fact, the association's strong conviction of the importance of long-range planning and provision of adequate water supplies was strongly reaffirmed by the board of directors last month, by its adoption of resolution 85-1, which is included here for the record.

I would like to highlight just two paragraphs in the resolution. One says:

The association believes continued advertisement of the basin as drought-prone to be economically adverse and further believes that the chronic drought problem may be alleviated through proper long-range planning, funding, public education, construction of water storage and distribution systems, and use of conjunctive schemes.

And second that:

The board of directors hereby directs the executive director and appropriate officers and members to initiate meetings and other measures with the Delaware River Commission and other planning agencies to ascertain the level of interest and concern for long-range planning; and further, encourages congressional action to support funding for such planning. Said planning shall include, but not be limited to, funding for long-range financial and technical planning, including feasibility, institutional arrangements, plan implementation, and methods of paying for capital and operation and maintenance costs.

The Association operates on the policy that all those dependent on the Delaware River basin for water have the right to an adequate, dependable water supply, based on reasonable cost, and also on the assurance that such a supply will be made available to them within the foreseeable future.

We believe that much too much emphasis has been based on the philosophy of managing droughts, rather than managing the resources needed to overcome the vagaries of nature.

We have been told in the Delaware basin that water conservation is the key to water management. As a result of the last 5 years of drought, we have certainly learned the value of water conservation efforts; however, we believe it is clear that while water conservation is one of the keys to resource management, it is not the only key.

The association has learned from its studies and from working with others in the basin, that water is not being used in excess. Many new homes are being built with water saving devices, and industry, long ago, responded with economic incentives of reducing fuel consumption, saving energy and reducing the cost of waste water treatment.

All of these factors led to significant and ongoing water conservation efforts by industry. It is clear that we have learned the lesson on how to conserve or, in some cases, how to do without, but we have not yet used the other keys of management. In this regard, the association was provided strong support for the Delaware River basin Commission. We work in every way possible to encourage the commission to expand its efforts toward long-range planning to develop sufficient storage and distribution facilities to meet foreseeable water needs in the basin.

We strongly believe that storage and distribution facilities are the principal keys to water resource management. In looking to the Federal Government for leadership, we see the need for a national water policy. This should be a policy that is generic in nature and should deal with the principles, not the details, of water resource management—quality, quantity, ground water management, flood control, and management of coastal and navigational resources.

This leadership would provide the policies needed by State and regional planning agencies as they in turn implement projects and programs. Here again, the Delaware River Basin Commission is one of only two compact commissions in the Nation, and is in a unique position to use a national water policy for development of implementable water management programs for the Delaware River basin.

Finally, there is a need to understand the importance of water to a healthy economy. In 1982, the association completed a 2-year study for the Delaware River Basin Commission that outlined clearly the economics of insufficient water supplies to basin industries.

The good faith agreement that I mentioned earlier calls for a 15-percent reduction in consumptive use of water during drought periods. Our study showed that as little as a 10-percent cut in consumptive use could cost thousands of jobs and millions of dollars. We believe, therefore, this planning principle should be reversed. Plans should be designed to provide enough supply to meet the higher demands that exist during droughts, keeping in mind the increasing costs of water.

A partial answer to who's minding the storage is found in the good faith agreement, which indicates that the private sector, namely, the electric utility industry, will provide its own reservoir to replace water used consumptively in the generation of electricity. Construction of this project is expected to begin this fall.

New York State agreed to study the potential for enlarging one of its basin reservoirs, and the DRBC promised modification of existing F.E. Walter and Prompton Reservoirs to include water supply storage, with completion of both scheduled for 1990 and 1995, respectively.

At present, there are no funds available for construction and so the question "Who's minding the storage?" remains.

The association is concerned that 5 years of negative advertising has been economically harmful to the Delaware basin States with obvious water shortages still advertised to attract businesses and industries. We are concerned that the Delaware River basin advertisement as a drought-prone area offers an economic disincentive to new businesses and industries which might otherwise be attracted to the region.

Also, there may come a time that major agricultural production may start to swing toward the water-rich area of the East. We stand unprepared to deal with changes such as this. The Water Resources Association for 26 years has held annual conferences to focus attention on critical water issues. These Delaware basin forums provide unique opportunies where differing points of view may be fairly presented in a neutral atmosphere.

On October 28 and 29 of this year, WRA's conference will include this very topic: Who's Minding the Storage? Here again, we will use the conference format as a form to bring together water managers and concerned public. The association acts as a catalyst to encourage understanding of the issues and to obtain a consensus toward resolving problems and developing plans and programs to provide for a sound economy and adequate dependable water supplies for all of the people in the Delaware River basin.

I thank you for the opportunity to present these points of view on the water management for the basin.

[The prepared statement of Mr. Stewart follows:]

WRA
DRB

# STATEMENT TO THE
# SUBCOMMITTEE ON WATER AND POWER
# OF THE
# ENERGY AND NATURAL RESOURCES COMMITTEE

## REGARDING
## WATER SUPPLY ISSUES OF THE MID-ATLANTIC REGION

PRESENTED BY

BRUCE E. STEWART
EXECUTIVE DIRECTOR
WATER RESOURCES ASSOCIATION OF THE DELAWARE RIVER BASIN
VALLEY FORGE, PENNSYLVANIA

Wednesday, August 7, 1985
10:30 a.m.
Council Chambers of the
Municipal Building
820 Mercer Street
Cherry Hill, New Jersey

WATER RESOURCES ASSOCIATION
OF THE DELAWARE RIVER BASIN
Box 867, Davis Road
Valley Forge, Pa. 19481

STATEMENT PRESENTED TO THE
SUBCOMMITTEE ON WATER AND POWER OF THE
ENERGY AND NATURAL RESOURCES COMMITTEE
REGARDING
WATER SUPPLY ISSUES OF THE MID-ATLANTIC REGION
Wednesday, August 7, 1985 10:30 a.m.
Council Chambers of the Municipal Building
820 Mercer Street
Cherry Hill, New Jersey

Good morning. My name is Bruce E. Stewart. I am Executive Director of the Water Resources Association of the Delaware River Basin. The Association is a non-profit, non-partisan, technically oriented conservation organization. Our job is to serve as an advisor, advocate, and watchdog over the waters of the four-state Delaware River Basin, and to offer constructive commentary as appropriate on water resource issues. The WRA has a broad membership base, including individuals, civic groups, farmers, businesses, water suppliers, and major industries located throughout the four-state Basin.

In my remarks today, I would like to point out and illustrate what we believe are four serious problems in the Delaware River Basin that need to be remedied. These problems may all be expressed as needs:

1. There is a need for long-range planning;
2. There is a need for sound management of our water resources rather than management of what seem to be annual droughts;
3. There is a need for a national water policy; and
4. There is a need to understand the importance of water to businesses and industries which form the basis of our economy.

The Delaware River Basin is not a drought-stricken area, as our advertising would lead people to believe; but, rather, it is a water rich area that receives an average of 44 inches of rainfall per year. Clearly our problem is not one of a lack of water, but is one of a lack of storage and distribution facilities. We seem unable to bring water to the people, and this raises the question - with no levity - "Who's minding the storage?". During the past 10 years, it has become increasingly apparent that the water supply system of the Delaware River Basin is inadequate to meet present needs, let alone future demands. Here are some highlights from recent years that reflect the seriousness of the problem.

During the 1980-82 drought:

- Many Pennsylvania municipalities were rationed down to 25 gallons per person per day;
- Reservoirs ran dry;
- Over 4,500 new wells were drilled as a result of the drought;
- Serious fires occurred;
- Some fire companies were told to find other sources of water;
- Newark, N.J. was reported to be within days of being out of water;
- The Hackensack Water Company reported 800,000 people in jeopardy with just 25 days supply left;
- An emergency pipeline was laid across the George Washington Bridge to bring water into northern New Jersey.

In 1983, a year with 55 inches of rain, we saw a drought that caused over $80 million worth of damage to farmers in the Delaware River Basin.

And, this year - 1985 :

- Is the fourth year out of the last five in which the Delaware River Basin has found itself in drought status;
- In northern New Jersey, water in 93 municipalities was rationed;
- There are general bans on non-essential uses of water and calls for water conservation programs throughout the Delaware River Basin.

The thread that links these problems is the need for sound and solid long range water resource planning. We believe all of the problems just mentioned could have been avoided if the responsible agencies in the Basin had had the foresight to develop genuine long range plans and the means by which to implement them. At present, the Level B Study for the Delaware River Basin and its companion the "Good Faith Agreement", both of which were developed over a period of approximately seven years, look no farther to the future than the year 2000. At one time that target seemed light-years away. Mathematically, it is 15.

The Association's contention is that long range planning should span at least 50 years, in view of the lead-time required for the development of water resource projects. For example, the Wanaque South Project in northern New Jersey, which has just begun, is the result of 30 years of hard work and a great deal of cooperation by the sponsoring agencies. Another example, the Point Pleasant Project in southeastern Pennsylvania, a small pumping station on the Delaware River, has been in the planning stages for 13 years and in the courts for five. In fact, the Association's strong conviction of the importance of long range planning and provision of adequate water supplies was strongly reaffirmed by the Board of Directors last month through its adoption of Resolution 85-1, which is included here for the record. I would like to highlight two paragraphs from this resolution.

> "...the Association believes continued advertisement of the Basin as 'drought prone' to be economically adverse and further believes the chronic drought problem may be alleviated through proper long range planning, funding, public education, construction of water storage and distribution systems, and use of conjunctive use schemes...
>
> "...the Board of Directors of the Water Resources Association hereby directs the Executive Director and appropriate Officers and Members to initiate meetings and other measures with the Delaware River Basin Commission and other planning agencies to ascertain the level of interest and concern for long range planning, and further encourages Congressional action to support funding for such planning. Said planning shall include, but not be limited to, funding for long range financial and technical planning, including feasibility, institutional arrangements, plan implementation; and methods of paying for capital and operation/maintenance costs."

The Association operates on the policy that all of those dependent on the Delaware River Basin for water have the right to an adequate, dependable water supply based on reasonable cost, and also on the assurance that such a supply will be made available to them within the foreseeable future. We believe that much too much emphasis has been placed on the philosophy of managing droughts rather than managing the resources needed to overcome the vagaries of nature. We have been told in the Delaware Basin that water conservation is the key to water management. As a result of the last five years of droughts, we have certainly learned the value of water conservation efforts. However, we believe it is clear that while water conservation is one of the keys to resource management, it is not the only key. The Association has learned from its studies and from working with others in the Basin that water is not being used in excess. Many new homes are being built with water saving devices. Industry long ago responded to the economic incentives of reducing fuel consumption, saving energy, and reducing the cost of wastewater treatment. All of these factors led to significant and on-going water conservation efforts by industry. It is clear that we have learned the lesson on how to conserve - or in some cases to do without - but we have not yet used the other keys of management. In this regard, the Association has provided strong support for the Delaware River Basin Commission. We work in every way possible to encourage the Commission to expand its efforts toward long range planning to develop sufficient storage and distribution facilities to meet foreseeable water needs in the Basin. We strongly believe that storage and distribution facilities are the principle keys to water resource management.

Looking to the federal government for leadership, we see the need for a national water policy. This should be a policy that is generic in nature in that it should deal with the principles - not the details - of water resource management: quality, quantity, groundwater management, flood control, and management of coastal and navigational resources. This leadership would provide the policies needed by state and regional planning agencies as they, in turn, implement programs and projects. Here, again, the Delaware River Basin Commission is one of only two "compact commissions" in the nation, and is in a unique position to use a national water policy for development of implementable water management programs for the Delaware River Basin.

Finally, there is a need to understand the importance of water to a healthy economy. In 1982, the Association completed a two-year study for the Delaware River Basin Commission that outlined clearly the economic impacts of insufficient water supplies to Basin industries. The "Good Faith Agreement" that I mentioned earlier calls for a 15% reduction in consumptive use of water during drought periods. Our study showed that as little as a 10% cut in consumptive use could cost thousands of jobs and millions of dollars. We believe, therefore, this planning principle should be reversed. Plans should be designed to provide enough supply to meet the higher demands that exist during droughts, keeping in mind the increasing costs of water.

A partial answer to "Who's minding the storage?" is found in the "Good Faith Agreement" which indicates that:

- the private sector; namely the electric utility industry, will provide its own reservoir to replace water used consumptively in the generation of electricity. Construction of this project is expected to begin this fall.

- New York State agreed to study the potential for enlarging one of its Basin reservoirs; and
- the DRBC promised modification of the existing F.E. Walter and Prompton reservoirs to include water supply storage, with completion of both scheduled for 1990 and 1995, respectively. At present there are no funds available for construction.

And so, the question "Who's minding the storage?" remains.

The Association is concerned that five years of negative advertising has been economically harmful to the Delaware Basin. States with obvious water shortages still advertise to attract businesses and industries. We are concerned that the Delaware River Basin advertisement as a drought-prone area offers an economic disincentive to new businesses and industries which might otherwise be attracted to the region. Also there may come a time that major agricultural production may start to swing toward the water-rich area of the East. We stand unprepared to deal with changes such as this.

The Water Resources Association, for 26 years, has held annual conferences to focus attention on critical water issues. These Delaware Basin forums provide unique opportunities where differing points of view may be fairly presented in a neutral atmosphere. On October 28 and 29 of this year, the WRA's Fall Conference will include this very topic: "Who's minding the storage?". Here again, we will use the conference format as a forum to bring together water managers and concerned public. The Association acts as a catalyst to encourage understanding of the issues and to obtain a consensus toward resolving problems and developing plans and programs to provide for a sound economy and adequate, dependable water supplies for all of the people in the Delaware River Basin.

Thank you for the opportunity to present these points of view on the water management needs for the Delaware River Basin.

WATER RESOURCES ASSOCIATION
OF THE DELAWARE RIVER BASIN
Box 867, Davis Road
Valley Forge, Pa. 19481

## RESOLUTION #85-1

WHEREAS, since its inception, the Water Resources Association of the Delaware River Basin has advocated provision of an assured water supply to meet the needs of those dependent upon the Delaware River Basin, and

WHEREAS, recent reports prepared for the Association by the Water Policy Planning and DRBC Evaluation Committees proposed certain policies including, but not limited to: 1) the rights of all residents to adequate, dependable, and reasonably priced water supplies; and 2) the need for long range planning that recognizes the obligation to meet reasonable and expected future water needs; and

WHEREAS, although the Delaware River Basin receives an average annual precipitation of 44 inches, the Basin has been declared in drought status for four of the last five years, and

WHEREAS, the Association believes continued advertisement of the Basin as "drought prone" to be economically adverse and further believes the chronic drought problem may be alleviated through proper long range planning, funding, public education, construction of water storage and distribution systems, and use of conjunctive use schemes, and

WHEREAS, the Association believes that funding may be limited for planning and construction programs, and there is a need to proceed in a timely manner in order to minimize competition for planning funds.

NOW, THEREFORE, BE IT RESOLVED, the Board of Directors of the Water Resources Association hereby directs the Executive Director and appropriate Officers and Members to initiate meetings and other measures with the Delaware River Basin Commission and other planning agencies to ascertain the level of interest and concern for long range planning, and further encourage Congressional action to support funding for such planning. Said planning shall include, but not be limited to, funding for long range financial and technical planning, including feasibility, institutional arrangements, plan implementation; and methods of paying for capital and operation/maintenance costs.

Approved by the Board of Directors

Bruce E. Stewart Secretary

July 19, 1985 Date

## Report I

# A Preliminary Assessment of Drought Impacts on Basin Industries

Prepared By:
WRA/DRB
Committee on Water Use Priorities

October 19, 1982

**WATER RESOURCES ASSOCIATION
OF THE DELAWARE RIVER BASIN**
**Valley Forge, Pennsylvania**

# REPORT I

## A PRELIMINARY ASSESSMENT OF DROUGHT IMPACTS ON BASIN INDUSTRIES

BY
WRA/DRB
COMMITTEE ON WATER USE PRIORITIES

Water Resources Association
of the Delaware River Basin
Box 867, Davis Road
Valley Forge, Pa. 19481

October 19, 1982

WRA
DRB

**WATER RESOURCES ASSOCIATION** OF THE DELAWARE RIVER BASIN

Box 867, Davis Road
Valley Forge, PA 19481
(Code 215) 783-0634

DR. JOHN L. BUZZI, President
BRUCE E. STEWART, Executive Director and Secretary

October 19, 1982

Mr. Gerald M. Hansler
Executive Director
Delaware River Basin Commission
25 State Police Drive
P.O. Box 7360
West Trenton, N.J. 08628

Dear Jerry:

It is with pleasure and a sense of accomplishment that I submit to you Report I entitled, "A Preliminary Assessment of Drought Impacts on Basin Industries". This Report was prepared by the Committee on Water Use Priorities, a Committee of the Water Resources Association of the Delaware River Basin.

The Committee was charged to investigate the loss of jobs and productivity that might result from forced curtailments of water and to advise the Commission on methods of implementing such curtailments.

Although not a given responsibility, the Committee has offered its advice on other matters relevant to water management. One such item developed as a persistent thread throughout the Committee's studies, namely, that a major reservoir such as Tocks Island Dam or an equivalent flow capability is needed. This capability is required if the Basin is to have sufficient water to insure realistic economic growth for the future.

It is also our recommendation that this Committee continue as an advisor to the Commission and assist in developing such drought management plans. These plans are vital if increasingly frequent water shortages are not to causeeconomic disorder in the Delaware Basin.

It was announced at your September 1982 meeting that the 1980-81 drought was a 1 in 10 year occurrence, making droughts of that severity a relatively common event. All the more reason then for the Commission to proceed rapidly with the development of drought management plans as recommended in this Report.

I thank the Committee members for their contribution of time, travel, and knowledge in developing this Report. I believe you will find the Report helpful in preparing drought management plans for the Basin.

Sincerely,

Robert E. Copeland
Chairman
Committee on Water Use Priorities

REC/cmd
Enclosure

OFFICERS AND DIRECTORS LISTED ON REVERSE SIDE

## OFFICERS

| | |
|---|---|
| DR. JOHN L. BUZZI, President | President, Kupper Associates, N.J. Alliance for Action |
| JAMES A. SHISSIAS, Vice President (N.J.) | Gen. Mgr. Environ. Affairs, Public Service Electric & Gas Corp. |
| WILLIAM J. MILLER, JR., Vice President (DEL) | Director, Delaware River and Bay Authority |
| ROSWELL P. SANFORD, Vice President (N.Y.) | Publisher, Catskill Mountain News |
| DAVID C. YAECK, Vice President (PA) | Executive Director, Chester County Water Resources Authority |
| ROBERT A. LUKSA, Treasurer | Executive Vice President, Philadelphia Suburban Water Co. |
| THOMAS M. SNOVER, Associate Treasurer | Vice President, Roy F. Weston, Inc. |
| CHARLES E. STEWART, Executive Director and Secretary | |

## DIRECTORS

**RICHARD ABRAMS**
Richards, Layton & Finger

**HARRY J. BORCHERS**
Executive Manager
North Penn Water Authority

**KENNETH R. BROOME**
Manager, Engineering
Hydroelectric Power
O'Brien and Gere Engineers, Inc.

**ROBERT E. COPELAND**
Marketing Manager
O'Brien and Gere Engineers, Inc.

**JOHN J. COSCIA**
Executive Director
Delaware Valley Regional Planning
Commission

**ROBERTA SCOTT EHRENBERG**

**HAROLD F. ELKIN**
Director
Environmental Affairs,
Energy Conservation
Sun Company, Inc.

**GERALD S. FARBER**
Supervisor, Community Planning
Pennsylvania Power & Light Co.

**COL. MATTHEW J. FREDA**
Matthew J. Freda Real Estate

**DAVID S. FROELICH**
Executive Director
Wissahickon Valley Watershed
Association, Inc.

**JOHN R. GALLOWAY**
Director, Public Affairs
Eastern Region
Gulf Oil Corporation

**HOWARD J. GROSSMAN**
Executive Director
Economic Development Council of
Northeastern Pennsylvania

**ROBERT J. HANSON**
Manager, Engineering Administration
and Environmental Quality
ICI Americas, Inc.

**RONALD L. HARPER**
Manager, Public Information
Philadelphia Electric Company

**KENNETH F. HARTE**
Director
Lehigh River Restoration Association

**MRS. HAROLD H. HASKIN**
League of Women Voters of NJ

**THOMAS IEZZI**

**JAMES J. KENNEDY**
President
Alfred Crew Consulting Engineers

**ROLAND LEATHRUM**
Senior Engineer
E.I. du Pont de Nemours & Co., Inc.

**KEVIN G. LYNOTT**
Manager, Governmental Affairs
Jersey Central Power & Light Co.

**JOHN L. McDONNELL**
Manager, Public Affairs
Atlantic City Electric Company

**WILLIAM G. McDOWELL**
Director of Engineering
Merck Sharp & Dohme

**CARL MATTIA**
Manager of Environmental Activities
PQ Corporation

**ROBERT F. MOLZAHN**
Manager of Environmental Affairs
Delmarva Power and Light Company

**DAVID F. MOORE**
New Jersey Conservation Foundation

**KENNETH R. MYERS, Esquire**
Morgan, Lewis & Bockius

**JAMES M. POLICELLI**
Energy Engineer, Legislative and
Regulatory
Bethlehem Steel Corp.

**GARY P. RABIK**
Supervisor of Environmental Activities
Atlantic Richfield Company

**ROBERT C. RICHERT**
National Environmental Development
Association

**CHESTER A. RING, 3rd**
Executive Vice President
Elizabethtown Water Company

**DR. PAUL ROSENSTOCK**
Manager, Development and
Environmental Control
Rohm and Haas Delaware Valley, Inc.

**WALTER B. SATTERTHWAITE, JR.**
President
Walter B. Satterthwaite Associates, Inc.

**A. C. SCHULTES, III**
President, A. C. Schultes and Sons, Inc.
President, Waste Conversion, Inc.

**A. JAMES SEDERIS**
Director
Corporate Environmental Affairs
Hoffmann-LaRoche, Inc.

**RAYMOND H. SNYDER**
General Manager
Lehigh County Authority

**FREDERIC STAPLETON**
Superintendent of Air Quality
New York State Electric & Gas Corp.

**HAROLD D. SURSA**
Executive Director
Bucks County Water and
Sewer Authority

**FERDINAND K. THUN**
Chairman of the Board
Schuylkill River Greenway Association

**RICHARD TOMPKINS**
President, Middlesex Water Company

**COL. JAMES G. TON, USA (Ret.)**
Consultant
Wagner-Hohns-Inglis, Inc.

**JOHN R. TRAINO**
New Jersey Association of
Soil Conservation Districts

**DR. ROBERT D. VARRIN**
Director
Water Resources Center
University of Delaware

**DAVID B. WITWER**
Executive Director
Pennypack Watershed Association

## DIRECTORS EMERITUS

**PAUL M. FELTON**

**EDWIN L. GERBER**

**GIFFORD GRIFFIN**

**CLAYTON M. HOFF**

**ROGER D. LEY**

**JAMES W. MYERS, JR.**

**COURTLAND STEELMAN**

## TABLE OF CONTENTS

Abstract

Note To The Reader

Executive Summary i

Introduction 1

I - Economic Impacts 4

II - Priority of Allocation 10

III - Supplemental Findings 15

Appendices

Appendix A - Glossary 18

Appendix B - Map of Geological Distribution of Some Industries Surveyed 21

Appendix C - Questions Researched By Subcommittees 22

Appendix D - Conservation Order No. 5, Resolution 81-8, DRBC, February 18, 1981 25

Appendix E - Sample Drought Management Plans

$E_1$ - Sample 1, Municipality 27

$E_2$ - Sample 2, Water Company 30

Appendix F - COWUP Committee Structure 34

Appendix G - Resolution 81-13 - Establishing A Water Use Reduction Advisory Committee, DRBC, March 25, 1981 35

# A Preliminary Assessment of Drought Impacts on Basin Industries

## ABSTRACT

In response to a request from the Delaware River Basin Commission, the Water Resources Association of the Delaware River Basin Committee on Water Use Priorities undertook an assessment of the economic consequences to major water users of forced curtailments of water used consumptively. The Committee concluded that many water users could reduce their total water withdrawals without incurring serious economic consequences. However, if it became necessary to curtail consumptive uses of water, the economic consequences would be severe and far-reaching. Further, the relatively small reductions in consumptive uses would result in minor benefits to stream flow. The Committee believes that sound water management should be based on provision of adequate water supplies to maintain or improve present economic levels.

## NOTE TO READER

The format of this Report was designed to provide you with the Committee's responsibilities and its findings in concise terms. The conclusions of the Committee are presented first in the ABSTRACT and then in the EXECUTIVE SUMMARY.

The body of the Report includes an INTRODUCTION, a brief explanation of the PROCEDURES followed by a more detailed explanation of the FINDINGS. Additional information, including a Glossary Of Terms and Committee Structure, may be found in the APPENDIX.

## EXECUTIVE SUMMARY

It seems clear from the data gathered and discussions with water managers and researchers that the water supply problem of the Delaware River Basin may be expressed simply, to wit: Today even a moderate downward departure from the long-term average rainfall can trigger a minor drought crisis for which there would be insufficient water to meet present demands. No matter what the actual numbers, the inescapable conclusion is that the Delaware River Basin must be provided with increased water supplies if even present levels of employment and standards of living are to be maintained.

Studies by the TVA have shown that after a region experiences a publicized water shortage, it takes at least ten years before the business and industry communities' interest in expanding activities in the affected area revives in response to publicized assurances that the problem has been corrected and all is well.

It is quite clear the drought of '79-'82 has raised the level of concern of existing industry and warned potential businesses and industries that the Delaware River Basin does not have an assured water supply.

## FIRST CHARGE

Determine and evaluate the impact to industry, municipalities, and agriculture resulting from mandatory reductions in water withdrawals and water consumption.

Findings:

1. There is a definite relationship among total water use including consumptive uses, employment, and industrial productivity.

2. A drought requiring a 10% reduction in consumptive water use would result in a loss of about 9,000 jobs and production losses of nearly $180 million/month (over $500 million per quarter).

3. The highly seasonal requirement for water in several high-priority industries, particularly agriculture and public water supply, significantly complicates the task of developing a plan for allocating water scarcity.

4. The DRBC, as a first step in developing a plan for the allocation of water during droughts, should revise and publish its Staff Report entitled, "Priorities Of Water Use In The Delaware River Basin: A Rational Means Of Industrial Allocation During Water Shortage Or Emergency".

5. The detailed data on industrial water use developed by the DRBC under Conservation Order No. 5 (see Table 1, Page 7) should be refined and included in the above report. These data should be maintained biennially and made available as a tool fpr assessing the economic impacts of potential water shortages.

6. The current (1982) DRBC staff study on industrial water reuse vs. net water loss should incorporate the findings contained in this report of the Committee on Water Use Priorities.

## SECOND CHARGE

Consider whether water use restrictions should be imposed on a priority system based on production/employment, or on a flat rate basis.

Findings:

1. The first priority for allocating scarce water supplies should be placed on human life, health, safety, and general welfare and should recognize the human benefits obtained from agriculture and the need for electric power during emergencies.

2. A detailed water use curtailment plan should be developed, published, and coordinated among all concerned parties. The plan should set forth specific user-related curtailments to be imposed at each of the drought stages.

3. Since the drought of the 60's, many industries have implemented a variety of conservation measures to reduce wasteful water use as well as to reduce the costs associated with wastewater treatment and energy losses.

4. During droughts, those businesses and industries that have undertaken effective conservation programs should be eligible for relief from water use restrictions.

5. Separate management approaches for water use curtailments should be adopted for: 1) those with relatively limited supplies, such as surface reservoirs and groundwater; and 2) those who depend on major rivers and large tributaries.

6. The DRBC should prepare a water quality contingency plan which: 1) protects human life, health, and safety; and 2) provides for temporary relaxation of temperature and other quality standards during drought periods in an effort to sustain commercial and industrial productivity, employment, and other high-priority uses of water.

Supplemental Findings:

1. The DRBC should develop and implement a comprehensive, continuing public information and education program designed to create an awareness among all Basin water users on the state of the Basin's water supply.

2. The Basin States, DRBC, or related state and Federal agencies should implement a program of agricultural irrigation technology transfer designed to achieve Best Management Practices in the shortest possible time.

3. The following drought alerting program should be established:

   A. Drought Alert - program development time

   B. Drought Warning - implementation of initial water curtailments and case-by-case relief review

   C. Drought Emergency - successive curtailments and case by case relief reviews as needed

## Introduction

In early November of 1980 when a drought emergency in the Delaware River Basin appeared imminent, the Delaware River Basin Commission (DRBC) Executive Director, Gerald Hansler, requested the Water Resources Association (WRA) to establish an Ad Hoc Committee to address issues relevant to water use restrictions. In response to the Commission's request, the WRA immediately formed an Ad Hoc Committee (the "Committee") whose members are drawn from all four states in the Basin and who are representatives of the chemical, petroleum, paper, pharmaceutical, agricultural, recreational interests, municipal water purveyors, electric utilities, the legal profession and other community interests in the water resources field.

The Committee is chaired by Robert E. Copeland, Past President of WRA. At its first meeting on November 17, 1980, the Committee was specifically charged by Mr. Hansler to:

1. Determine and evaluate the impact to industry, municipalities, and agriculture resulting from mandatory reductions in water withdrawals and water consumption;

2. Consider whether water use restrictions should be imposed on a priority system based on production/employment, or on a flat rate basis.

At the Commission's public hearing of December 1, 1980, the Committee volunteered recommendations to the Commission on general matters concerning the then present Drought Emergency.

1. The Commission precede a drought emergency declaration with a Drought Alert followed by a Drought Warning. This is necessary to enable regulatory bodies, water purveyors, etc. to take steps to inform the public of facts about the drought and to allow major water withdrawers and water purveyors to adequately plan for water intake restriction.

2. The Commission fully support the actions taken by the state governors and mayors of major cities in the Basin as of December 1, 1980 in dealing with water shortages on a localized basis, so as to promote the credibility of the various governmental responses to the drought and so as to encourage uniform public cooperation in curtailment of water use.

3. The DRBC, through its individual commissioners, implement an equitable voluntary conservation program applicable to in-Basin and out-of-Basin users.

4. The Commission develop and enact an effective voluntary conservation program for the Basin calling for measures which will not impair productivity or employment.

5. The Commission appoint the Committee to develop a conservation plan to be enacted in the event of need for mandatory water use restrictions or water rationing, or to develop detailed current data on the effect on various groupings of water users of water cutbacks.

6. The Commission enact publicity programs designed to inform the public on the status, implications and reasons for water shortages in the Basin and service area as well as necessary measures to respond to the drought.

On February 18, 1981, the Committee submitted a preliminary report dealing with "possible water use reductions for industry, agriculture and municipalities and an assessment of the likely impacts of those reductions". The Committee reiterated its earlier recommendations to the DRBC and presented its preliminary conclusions as follows:

1. Many water users could tolerate a 10% reduction in water withdrawals without serious consequences.

2. Some classes of industry and agriculture would be likely to experience immediate reductions in productivity, employment, and loss of investment from a 10% reduction in water withdrawals.

3. Reduction of consumptive uses by industry would result in reduced productivity and employment.

4. Water utilities within all likelihood need a rate relief mechanism if total water usage was reduced more than 25% over a long period of time.

In concluding its preliminary recommendations, the Committee pointed out that any broad-based attempt to significantly reduce consumptive use could have severe economic consequences with insignificant drought relief. The Committee asked for further time to investigate the means by which water use reductions should be applied as well as to refine the data regarding the economic impacts associated with forced water reductions.

## Procedure

In pursuit of its task of evaluating the economic impacts of water use reductions, the Committee was divided into eight subcommittees, each dealing with a specific industrial group in the Basin. Each subcommittee, under the direction of its Chairman, gathered additional members and sources of expertise beyond that of the Water Resources Association proper. A series of questions was posed and given to each subcommittee for resolution (see Appendix C - "Questions Researched By Subcommittees"). It was agreed that the information developed by each subcommittee in response to the questions posed would be summarized and returned to the subcommittee for refinement and consolidation. Subcommittee reports were then blended to form a report of the Committee as a whole.

During 1981, each subcommittee scheduled its individual meetings, researched and developed answers to the series of questions posed, and reviewed and revised the preliminary draft of its subcommittee report.

Portions of the data gathered were considered to be confidential and are not published here. These data were made available only to the subcommittee representatives or the Chairman of each subcommittee on the premise that the data and their sources were to be kept confidential. As a result of Conservation Order No. 5 passed on February 18, 1981 (See Appendix D) the Delaware River Basin Commission obtained a great deal of information from major water users regarding their sources of water and amount of water used consumptively. These data were compiled into contingency charts by the Commission Staff and provided to the Water Use Priorities Committee. The DRBC data are on file with the Commission.

The Committee is of the opinion that data required to prepare a detailed drought contingency plan are distributed among many sources and not readily available in a central location. These data should be compiled at a single location and kept current for use by Basin water managers.

## I - Economic Impacts

First Charge to Committee

Determine and evaluate the impact to industry, municipalities, and agriculture resulting from reductions in water withdrawals and in water consumption.

Background:

Approximately 50 water using industries were surveyed in an attempt to estimate the amount of water used and the probable loss of productivity and employment that would result from a forced reduction in water use. In addition, some 200 businesses were surveyed by the Recreation and Related Services Subcommittee. The DRBC, under Conservation Order No. 5, requested specific data regarding water supply sources and quantities used from all water users whose withdrawals from surface sources exceeded 1 Million Gallons Per Day (MGD). A summary of these data are presented in Table 1. The data developed by the DRBC displayed the economic impacts resulting from reductions in consumptive use, not total water withdrawals. Additional data would be required to evaluate the effects of total water withdrawal curtailments on employment and productivity. In order to make use of the DRBC data, the Subcommittees focussed, to a large extent, on the economic impacts related to consumptive use curtailments. Additional data were obtained directly from many other water users by WRA Committee members. The water using industries surveyed represented a wide cross section of industry, geographically distributed throughout the Basin (See Map, Appendix B). This survey resulted in a multi-disciplinary profile of major water users that ranged from manufacturing to public water suppliers.

Findings:

1. There is a clear relationship between both total water use and consumptive use and employment and productivity. This relationship varies widely among industries and may not be generalized. Agriculture is water intensive as is the petroleum industry. Other industries such as recreation/related services (construction, etc.) are dependent on water but use relatively little water in comparison to others. Total water withdrawal must be distinguished from consumptive or depletive uses and their respective economic impacts recognized.

-Petroleum Industry - There is a direct relationship between reduction in water withdrawals including consumptive uses and employment/productivity. A 10% reduction in total water withdrawal would result in approximately a 40% reduction in production of petroleum products and a 40% reduction in refinery usage. Production costs and employment figures were not available. It was anticipated that the employment impact would be more severe on contract labor than on industry employees. The total impact of reduced production of 40% would depend on economics and the demand for products at the time of reduction. Under proper economic circumstances, a 40% reduction in production could make the sale of products infeasible. For example, the price of petroleum products might rise to a level out of reach of the average consumer.

-Agriculture - As is true in the Petroleum Industry, the relationship between total water use and productivity in Agriculture is direct. Forced reductions in water use threatens the entire investment in farming including real estate and equipment. It was assumed that food products, to a large extent, would be replaced with imported products and most likely at a higher cost.

-For Water Suppliers, Recreation and Related Services, and Electric Utilities, the relationship of water withdrawals to employment and productivity is indirect in that impacts would be experienced by customers of these industries rather than by the primary industry.

-Drug and Chemical - There is no direct relationship between reduced water withdrawals and employment and production. However, the relationship of employment and production to reduced consumptive uses is direct, in that a 1% reduction in consumptive uses is equal to a 1% loss of employees and production. Further, it was assumed that lost production in the Basin would be supplemented by imports.

2. The economic data developed by the DRBC (See Table 1) for the Committee indicated that a 10% reduction in consumptive water use would result in a loss of about 9,000 jobs and production of nearly $180 million/month (over $500 million in three months). If a drought worsened to the point where a water reduction of 25% became necessary, then the job loss figure would reach about 12,000. Similarly, loss of productivity would reach about $230 million/month

and nearly $700 million/quarter. The Committee emphasizes that a 25% consumptive use reduction would increase stream flow by only about 40 cfs, an insignificant amount compared with the economic impact of severely curtailed production of many industries. The Committee emphasizes that the data developed by the DRBC and presented in Table 1 only reflect direct impacts. Secondary impacts which could arise because of interruption of utility service, for example, were not included.

The Electric Utility Industry (omitted from Table 1) pointed out that if steam-electric generation in the Basin were uniformly curtailed by 10% during normal peak-load periods, the curtailed capacity would most likely be replaced by oil-fired combustion turbine generation resulting in an increased cost to consumers of $500,000 to $700,000 per day and a net savings of only 11.5 cfs of flow in the Delaware River. Should water use curtailments at steam-electric stations in the Basin become necessary, such curtailments should be coordinated by the Pennsylvania-New Jersey-Maryland Interconnection (PJM).

## TABLE I

Summary of the relationship between reductions in consumptive water use and employment and productivity lost[1,2]

| INDUSTRY | UNITS[3] | | CONSUMPTIVE USE REDUCTIONS | | | |
|---|---|---|---|---|---|---|
| | | 10% | 25% | 35% | 50% | 100% |
| Cement[5] | E# | 0 | 224 | 224 | 224 | 224 |
| | C$ | 0 | | | | |
| Chemical | E# | 394 | 926 | 1113 | 2944 | 5145 |
| | C$ | $13.39 | $19.09 | $42.77 | $71.31 | $84.62 |
| Mining[5] | E# | 414 | 414 | 414 | 414 | 414 |
| | C$ | | | | | |
| Paper | E# | 526 | 1179 | 1545 | 2246 | 4011 |
| | C$ | $ 2.55 | $ 5.81 | $ 7.72 | $11.19 | $14.31 |
| Steel | E# | 3902 | 4994 | 8433 | 14,522 | 20,752 |
| | C$ | $ 8.03 | $11.93 | $18.64 | $33.27 | $38.85 |
| Turbines | E# | 0 | 400 | 800 | 4600 | 4600 |
| | C$ | 0 | $ 6.2 | $ 12.5 | $ 37.5 | $ 37.5 |
| Floor Covering | E# | 0 | 0 | 0 | 110 | 550 |
| | C$ | 0 | 0 | 0 | $ 0.67 | $ 5.2 |
| Recreation | E# | 3701 | 4109 | 5226 | 6619 | 19,735 |
| | C$ | $154.7 | $186.2 | $232.5 | $263.0 | $804.6 |
| Total Reduction in Employment | | 8937 | 12,246 | 17,755 | 31,679 | 55,431 |
| Total Cost (Millions)[4] | | $178.7 | $229.2 | $314.1 | $416.9 | $985.1 |

---

[1] Data reported to the DRBC under Conservation Order No. 5 by self-supplied industries over 1 MGD excluding the Electric Utility and Petroleum Industries and Agriculture. Recreation Industry data provided by WRA Subcommittee on Recreation and Related Services.

[2] The economic data are confined to direct impacts and do not reflect secondary effects.

[3] E# = Number of Manufacturing Personnel lost
C$ = Cost ($ Millions/Month)

[4] Total costs are exclusive of the Cement and Mining Industries for which no figures were given.

[5] The Committee expresses its concern that based on the data provided, the Cement and Mining industries appear relatively inelastic with respect to their ability to curtail production and employment on reduced levels of water in comparison with other industries.

3. Water use in some industries, namely Agriculture and the Public Water Supply Industry, is highly seasonal. Summer season droughts will cause serious damage to farmers since irrigation needs will peak along with the maximum needs of other water users. Non-growing season droughts will be harmful, but spread the impact more uniformly over the water users.

   Agricultural water use cannot be reduced to comply with water regulations without causing severe or irreparable damage to the farmers. Public water purveyors have an opportunity to curtail summer season water use to some extent by prohibiting or restricting outdoor water use, e.g., lawn watering, street washing, and unauthorized use of fire hydrants.

4. The Committee concludes that a great deal of valuable information is contained in a DRBC staff report of July 1976 entitled "Priorities of Water Use in the Delaware River Basin: A Rational Means of Industrial Allocation During Water Shortage or Emergency". The Committee believes that as a first step in developing a plan for allocating water during droughts the "priorities" report (above) should be revised and published. This report defines the relationships between employment, production, total and consumptive water use, and should serve as the basis for a drought allocation plan.

5. The detailed data on industrial water use developed by the DRBC under Conservation Order No. 5 should be refined and included in the above report. These data should be maintained biennially as a tool for assessing the economic impacts of managing water shortages.

6. The DRBC has undertaken a staff study of industrial water reuse vs. net water loss. The findings of this Committee (COWUP) should be incorporated in the DRBC industrial water use study.

Summary:

In response to Charge I, there appears to be a definite relationship between water withdrawals, consumptive use and productivity. This is more apparent in some industries than others. Conservatively stated, reductions in total water withdrawals of 10% could be accepted by industry with little or no effect on profitability or employment. Any reduction greater than 10% would have some impact on Basin industries and population as a result of "pass through" costs from impacted supplies of goods and services.

A 10% reduction in water withdrawal may be accomplished by conservation programs instituted by industries and others in the Basin. The Committee believes that a 10% reduction in water withdrawal will not substantially change the amount of water used consumptively by Basin industries and will provide minimal drought relief. Reductions of consumptive uses, however, may be expected to result in significant losses in productivity and employment.

Institution of Best Management Practices in many industries may permit a 10% reduction of total water withdrawal without penalty. Once the BMP is instituted, however, then a 10% reduction at a later date would be penalizing. The case for more water storage is made much clearer under these circumstances. Drought contingency planning and future storage requirements go hand in hand.

## II - Priority of Allocation

### Second Charge to Committee

Consider whether water use restrictions should be imposed on a priority system based on production/ employment, or on a flat rate basis.

Background:

The platform from which the Committee began its research on the second charge was the existing DRBC policy on emergency water allocations. The Committee agreed that the policy needed both further clarification and an implementing mechanism in order to be beneficial. The DRBC policy on the priority of water uses during emergencies was adopted on November 10, 1976 as Commission Resolution No. 76-18. This Resolution is excerpted as follows:

Step 1 "The Comprehensive Plan is amended by the addition of the following policy statement:

> During drought emergencies, the Commission, in allocating the available water supply in the Basin and its service area, will give first priority to those uses which sustain human life, health and safety, and second priority to water needed to sustain livestock. Thereafter, based on the doctrine of equitable apportionment, the remaining water will be allocated among producers of goods and services, food and fibres, and environmental quality in a manner designed to sustain the general welfare of the Basin and its employment at the highest practical level."

Step 2 "The Commission will undertake water resources and economic planning studies needed to give effect to this policy, formulate regulations to implement it, and will develop contingency plans to carry out the purposes of such regulations."

The Committee agreed that Resolution 76-18 needed further clarification before application during a drought.

Findings:

1. the Committee concurs with the priority of allocation which places first priority on human life, health, safety, and general welfare, but strongly speaks for recognition of the human benefits obtained from agriculture and the need for electric power during emergencies.

2. In order to implement Resolution 76-18, the Committee recommends the development of a detailed water use curtailment plan to be published, distributed, and coordinated among all concerned parties. The plan should set forth specific conservation measures and/or user-related curtailments to be imposed at each of the three drought stages.

3. Since the drought of the 60's, many industries have implemented a variety of conservation measures to reduce wasteful water use and to reduce the costs associated with wastewater treatment and energy losses. Public water suppliers have also strongly promoted conservation measures and undertaken programs to reduce water losses.

   -Agriculture. The agricultural industry has conducted research on improving the efficiency of water use in farming. Although much more work remains to be done, techniques such as mulching, low volume irrigation, dug water storage ponds, and minimum tillage have reduced water use. Some farmers have developed individual surface reservoirs and attempted to improve their water management systems as suggested by County Agents.

   -Drug/Chemical. Economic incentives led to an industry-wide reduction in water withdrawals. These incentives included reduced treatment cost of both fresh and wastewater, energy costs, and purchased water cost. Reduced water withdrawals, however, led to an increase in consumptive uses. The benefits of such conservation programs are reduced costs of operation and, in some cases, prolonging the possibly limited water supply of public water purveyors. Specific data were not obtainable in the relatively short time available to the Committee. Additional data may be obtained as the result of timely and funded research efforts.

   -Water Suppliers. The public water supply industry demonstrated that leak detection and sound maintenance programs will minimize water losses, reduce operating and maintenance costs, and postpone capital expenditures.

-Industry/Other. In some industries, consumptive water use is directly related to productivity. New technology and equipment, not conservation, would be required to avoid economic hardship. In most industries, non-consumptive water use is indirectly related to productivity. However, economic incentives, primarily due to wastewater treatment costs, are continually forcing reduced water withdrawal per unit of production. Other economic incentives include reduced raw material and energy requirements, risk of production curtailment due to water supply, and water and water treatment costs. Economic negatives of additional recirculation include increased risk of product contamination, productivity losses, and equipment corrosion.

-Electric Utilities. The Basin's Electric Utilities have been diligent in efforts to conserve Basin resources in the operation of their systems and promote conservation of energy among their customers. Such energy conservation measures are discussed in Section 11.C. of the July 1981 Master Siting Study -- Delaware River Basin. Several additional measures which the Electric Utilities might implement in support of a broad public effort to alleviate the effects of a drought emergency in the Basin are to: a) eliminate non-essential use of water at all company facilities; b) increase the frequency of testing or inspection of water systems at steam electric stations and correct any deficiencies at the first reasonable opportunity; c) inform customers and employees of the drought emergency, encouraging them to conserve water and to continue energy conservation practices.

It has been suggested that drought restrictions imposed upon other water uses would lead to a reduction in the demand for electric energy. For example: reduced municipal water use would lessen the energy needs of municipal water supply and wastewater systems; forced curtailment of water-dependent industrial operations would reduce the total industrial power load. Such load reductions are unlikely to lead to an equivalent reduction of generation in the Basin, however, because factors such as economic loading of capacity and system reliability ultimately determine the scheduling of units within the Pennsylvania-New Jersey-Maryland Electric Power Grid System (PJM).

4. During droughts, those businesses and industries that have undertaken effective conservation programs should be eligible for relief from water use restrictions. In order to request relief from imposed drought restrictions, those businesses and industries requesting same should demonstrate the following:

   a. implementation in the past of effective water conservation programs.

   b. present implementation of (or a binding commitment for) a feasible and effective water conservation program.

   c. anticipated hardship to the water user and/or anticipated hardship to the persons who will be affected by a curtailment to the water user.

   d. location of water use and the resulting benefit to the Basin water supply resources from the curtailment.

   A mechanism assuring immediate determinations of variance requests should be established.

5. It is the Committee's belief that curtailments of water, in order to be effective, must be dealt with under two distinct management approaches:

   a. Users dependent on limited supplies of water either groundwater or surface reservoirs, and

   b. Users who draw their supplies from the Delaware River or its major tributaries.

   In order to illustrate this finding, the Committee posed the following hypothetical situation:

   1. The DRBC declared a Drought Alert followed by a Drought Warning.

   2. Because of impending drought, the DRBC stated that total public cooperation was required to deal with the growing water shortage.

   Under these circumstances, the Committee believes that:

   a. For those users on limited water supplies, a flat rate 10% curtailment of total water withdrawal may be imposed.

   b. If deemed necessary, the water use of those industries using unlimited supplies may be curtailed 10% of total withdrawal on a case-by-case basis in accordance with the relief mechanism outlined in Finding 4.

  c. The Electric Utility Industry should be considered separately.

  d. Subsequent curtailments greater than 10% should be imposed on a case-by-case basis so as to maintain the highest level of employment consistent with established water supply and stream flow criteria.

6. The DRBC, in conjunction with other agencies as needed, should prepare, coordinate with potentially affected water users, and publish a water quality contingency plan. The plan should protect human life, health and safety and provide for temporary relaxation of temperature and other quality standards during drought periods. The purpose of such a plan is to attempt to sustain commercial and industrial productivity, employment, and other high priority uses of water during emergency periods.

## III - Supplemental Findings

Background:

During the course of developing base-line information for this report, many discussions were held in Subcommittee meetings and between Subcommittee members and their business and industrial colleagues. Information developed in this manner was reviewed and refined by the main Committee during its meetings throughout 1980-82 as the Report underwent several transformations. As the Report was being developed, information was obtained and conclusions drawn that, while not related directly to the Committee's charge, seem relevant to the need for a sound water management program for the Basin. In this spirit, the following recommendations are offered.

Findings:

1. The DRBC should develop and implement a comprehensive, continuing public education program designed to create an awareness among all Basin water users on issues regarding Basin water resources.

   The public education programs can be structured only after Commission goals on water usage, conservation and drought management have been delineated.

   Once the Commission goals or objectives are determined, the recommended public education procedure is as follows: 1) determine the appropriate audience that should receive the message; 2) specify the information to be relayed; and 3) identify the specific steps to implement the message. As the program is implemented, a clear mechanism should be established to provide a means of monitoring and adjusting program adequacy.

   The need for a continuing public education program is great and should not be overlooked. However, the vast majority of the input the Committee received centered on reactions to the public education programs of the recent drought emergency. The Committee's conclusions from that input are summarized below.

   a. Persons in charge of implementing or enforcing any water use restrictions or regulations must be informed of the content and effect of such regulations sufficiently in advance to appropriately plan for and to implement the regulations. This includes a recommendation that water utilities, municipalities, and government agencies be informed in advance of action the Commission is considering, so that the benefit of input from persons affected (industry, agriculture, water purveyors, etc.) and persons with expertise may be obtained.

b. Information on the fact, content and effect of any drought regulations must be given directly to those in charge of implementing the regulations and those most affected by the regulations (industry, etc.) at least as soon as the information is given to the news media. Information received from the press may often be incomplete, inaccurate, or misleading. Moreover, those in charge of implementing regulation lose credibility and effectiveness if they are not kept fully informed of the regulations in a timely manner. Informing such entities in advance of possible Commission action as suggested in paragraph 1 is one means of insuring this.

c. If distinctions in regulations are made, some official explanation of the distinctions must be rendered; otherwise, the burden of explaining and dealing with complaints arising from distinctions falls on the shoulders of those who implement the regulations and not on those who write them.

d. If equitable responsibility is a goal of drought regulation, a public relations campaign should address this goal. For example, if down-stream users have less effect on the Basin waters than up-stream users, but equal restriction by all is called for (because total public cooperation is deemed necessary), a public relations campaign should call for uniform cooperation and should explain the reason for its necessity. The last drought emergency left many persons skeptical of whether a Basin-wide declaration was necessary.

e. Public misconceptions should be addressed. For example, many complaints were received that drought regulations put the burden of cut-backs on the homeowners. Industry conservation, which was significant, should have been publicized even if it was voluntary conservation.

f. The Commission must be available (by hot-line or otherwise) to explain or interpret its rules and regulations. In the last drought emergency, some persons were told to interpret the regulations as they saw fit with a resulting different interpretation of the same rules by systems a few miles from each other. Additionally, it is the Commission that formulates the rules, knows the total picture and knows what the thinking is behind its various actions.

g. The Commission should work with the various media to place ads, commercials, etc. and should make available brochures, booklets, pamphlets, posters, etc. for distribution by water purveyors, industry, etc. In the last drought, some of the large water purveyors at their own expense instituted public information and conservation programs by developing radio, television, newspaper, and hand-out materials.

2. The Basin States, DRBC, or related state and Federal agencies should implement a program of agricultural irrigation technology transfer designed to achieve Best Management Practices in the shortest possible time. Such a program should include research and development of practical equipment at affordable prices along with an intensive education program to demonstrate the benefits of irrigation conservation.

   Similar research and technology transfer programs should also be developed throughout the Basin for development of Best Management Practices in the industrial and public works segments of the economy. The prevention of runoff from housing developments, highway construction projects, parklands and commercial properties, with the goal of subsequent recharge of groundwater could appreciably increase underground storage for eventual use in surface water flow augmentation during drought. In addition, practical water conservation programs, among water-dependent industries, should also be promoted.

3. It remains the recommendation of the Committee that a "Drought Alert" stage should be established. The Alert stage should precede the present "Drought Warning" stage to enable the regulatory bodies, water purveyors, etc. to take the steps necessary to adequately inform the public on issues regarding the Basin's water supply and to allow time for affected agencies to begin formulating drought management plans (See Appendix E for two sample plans).

## APPENDICES

| | |
|---|---|
| Appendix A | Glossary |
| Appendix B | Map Demonstrating Geographic Distribution of Some Industries Surveyed by COWUP Subcommittees |
| Appendix C | Questions Researched by Subcommittees |
| Appendix D | Conservation Order No. 5, Resolution 81-8, DRBC, February 18, 1981 |
| Appendix E | Sample Drought Management Plans<br>$E_1$ - Sample 1, Municipality<br>$E_2$ - Sample 2, Water Company |
| Appendix F | COWUP Committee Structure |
| Appendix G | Resolution 81-13 - Establishing A Water Use Reduction Advisory Committee, DRBC, March 25, 1981 |

## APPENDIX A

# COMMITTEE ON WATER USE PRIORITIES
# GLOSSARY

Aquifer - A water-bearing geologic formation which transmits water from one point to another.

Best Management Practices - A policy of agricultural water and land use practices for maximum beneficial use of applied water.

cfs - Cubic feet per second. 1 cfs = 0.646 mgd - 1.983 acre-feet per day.

Conservation - The reduction of water uses by elimination of unnecessary and wasteful practices.

Consumptive Use - That fraction of water taken from Basin water supplies and not returned at any point. Consumptive use in this report is Basin-wide and may not reflect local water supply conditions.

COWUP - Committee On Water Use Priorities.

Depletive Use - Same as Consumptive Use.

Diversion - The taking of water from a body of surface water.

Doctrine of Equitable Apportionment - The allocation of water resources based on the needs of the user and other users and the availability and beneficial use of the water resources.

DRBC - The Delaware River Basin Commission.

DRBEUG - The Delaware River Basin Electric Utilities Group.

Drought - A condition of reduced water supplies due to dislocations in the natural hydrological cycle, most notably the lack of precipitation.

Drought Alert - A proposed first stage of notification to water users of impending water shortages due to drought.

Drought Declaration - A formal declaration of a Basin-wide drought based on established water supply reserve criteria.

Drought Warning - A formal warning of an impending drought declaration based on established water supply criteria.

Dug Reservoir - A reservoir constructed by removal of earthen materials to increase water storage over that available by impoundment of a natural stream.

Employment - Persons gainfully employed by direct water users. The effects of water use on pass-through or secondary employment are not considered in this report.

Low Volume Irrigation - Irrigation practices in which only water required by plants is applied with minimum runoff, percolation, or evaporation.

mgd - Millions of gallons per day. 1 mgd = 1.547 cfs = 3.07 acre-feet per day.

Minimum Tillage - An agricultural practice involving minimal disturbance of soils and subsoils to prevent erosion and water evaporation.

Mulching - An agricultural practice involving application of a covering material around plants to prevent water evaporation.

Nonessential Water Use - Water uses not required to maintain human life and safety or the production of goods and services. The term is usually applied to certain outdoor uses as ornamental fountains, lawn watering, car washing, and hydrant flushing.

PJM - The Pennsylvania, New Jersey, Maryland interconnection for distribution of electrical power.

Productivity - The value of goods and services produced by water users. The effects of water use on pass-through or secondary productivity are not considered in this report.

Publicly Supplied Water - Water supplied and distributed by public systems for domestic, commercial, and industrial uses.

Replacement Factor - A factor applied to consumptive use of salt water to calculate that fresh water replacement required to prevent salinity encroachment in the River. This factor has been ignored in this report to provide the most conservative view of consumptive use effects.

River Basin - The area drained by a river and its tributaries.

Self-Supplied Water - Water supplied by users for meeting their own needs.

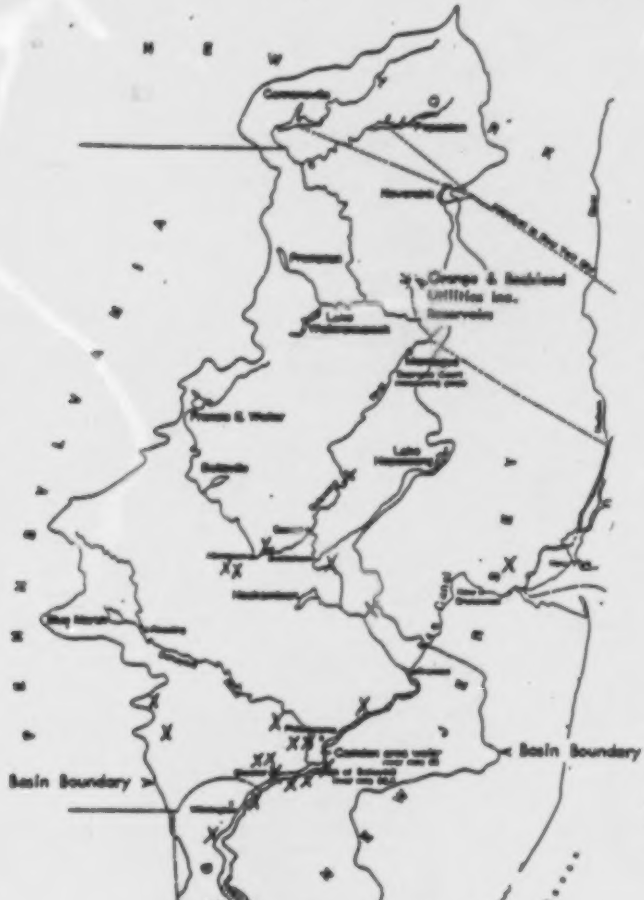
Water Utilities - Public and private corporations established for the supply, treatment, and distribution of public water supplies.

Withdrawal - The quantity of water removed from its source and used for any purpose.

WRA/DRB - The Water Resources Association of the Delaware River Basin.

APPENDIX B

## RELATIVE GEOGRAPHIC DISTRIBUTION OF SOME OF THE INDUSTRIES SURVEYED BY THE COWUP SUBCOMMITTEES


N E W
Y O R K
Orange & Rockland
Utilities Inc.
Reservoir
Lake
Lake
Basin Boundary
Basin Boundary
N
DELAWARE RIVER BASIN COMMISSION

## APPENDIX C

## QUESTIONS RESEARCHED BY THE SUBCOMMITTEES

1. How many industries are involved in your subcommittee?

2. What is the relationship between water use and employment/production?

3. Can water use be severely curtailed based on criteria that relate water use with employment/production?

4. In your subcommittee group, is water use seasonal? If so, how should seasonal usage be treated in an emergency?

5. Which industries have developed and put into place water use reduction programs since the drought of the 60's (or other drought) and to what effect?

6. What experiences can be called upon to demonstrate the effectiveness of water use reduction programs in terms of saving money, increasing productivity, or reducing costs?

7. If water use reduction programs were undertaken in the past, how were they paid for an is the same approach applicable today?

8. In the light of increasing energy costs, likelihood of increased water costs, and probable water shortages, what further changes can be made to reduce the use of water for processing and water consumed; i.e. evaporative/consumptive losses?

9. In the event of a drought, what measures should be provided to grant relief to those industries considered worthy of same and what criteria should guide this determination?

10. Electric utilities - compare the merits of reducing the generation of electricity in the Basin as a means of reducing consumptive losses. Consider economics, importation of energy, actual water that could be saved, etc.

11. Public relations - what programs should be instituted, by whom, to inform and educate Basin residents regarding water usage, conservation and drought management? What activities should be undertaken by residents, regulators and purveyors at each of the three drought stages (alert, warning, and emergency)? What should be the role of the DRBC vis-a-vis drought management/information/education during normal times? What long-term education programs should be developed?

12. Review, evaluate and determine how your industries would comply with DRBC's Resolution 76-18 on water use priorities.

13. Each committee should clearly point out aspects of water use management that should be known in order to understand their respective positions, and should feel free to add comments, philosophy or points of view, not previously addressed.

## APPENDIX D

### CONSERVATION ORDER NUMBER 5
### DRBC RESOLUTION NUMBER 81-8

A RESOLUTION implementing Emergency Resolution Number 81-1 and to require drought contingency information and plans by major water users.

WHEREAS, the Commission has declared a state of water supply emergency by its Emergency Resolution Number 81-1; and

WHEREAS, the signatory party states have taken or will take curtailment actions, as necessary, regarding major users within individual public water supply systems; and

WHEREAS, there exist major users within the basin who are not on public water supplies; and

WHEREAS, temporary curtailment in water use by large water users in the basin can have a beneficial impact on stressed public water supplies, streamflows and protection against salinity intrusion in the estuary; now therefore,

BE IT RESOLVED By the Delaware River Basin Commission:

1. All self-supplied users of ground or surface waters in the Delaware River Basin, exclusive of those in Cumberland and Cape May Counties in New Jersey, and below the Chesapeake and Delaware Canal in Delaware; whose use for any purpose was in excess of an average of 1 mgd during any 30-day period from January 1, 1980, to December 31, 1980, shall supply information to DRBC upon request and shall prepare contingency plans for water curtailment in the event that is necessary.

2. The information requested by DRBC shall include:

a) source of water supply
b) amount used
c) amount consumed
d) description of existing recycling and conservation measures
e) place of discharge for used and treated waste water
f) type of products produced
g) normal employment level (numbers)
h) estimated employment (numbers) and economic impact ($) for curtailment of consumptive use of water for each of the following levels of reduced consumptive use: 10%, 25%, 35%, 50%, 100%.

3. The Executive Director shall notify all major water users subject to the requirements of this conservation order and request submission of water use information and contingency plans by March 31, 1981.

4. Implementation of contingency plans or orders for water use curtailment shall be at the discretion of the Commission.

5. This resolution shall take effect immediately.

s/Steven J. Picco
Steven J. Picco, Chairman pro tem

s/W. Brinton Whitall
W. Brinton Whitall, Secretary

ADOPTED: February 18, 1981

APPENDIX $E_1$

## SAMPLE 1
## DROUGHT WATER EMERGENCY PLAN
## MUNICIPALITY

The following is the water emergency plan for consumers of city water. The City Water Commissioner is empowered by the City Code to declare a water emergency and to implement this water emergency plan. The code provides for the imposition of fines and shut off of service for non-compliance with the water emergency plan.

The water emergency plan is comprised of three phases: 1) voluntary conservation, 2) mandatory conservation, and 3) water rationing.

The first phase of the water emergency plan calls for voluntary conservation through elimination of various unnecessary uses. The City and the Chamber of Commerce will also work with commercial and industrial representatives to develop mandatory and water rationing plans for Phases II and III. Effort will be made to identify water reduction techniques which will not affect employment level.

Phase II requires water conservation and prohibits various unnecessary water uses. Compliance is obtained through the imposition of fines and shut off. Commerical and industrial water users are required to reduce water which does not affect employment level.

Phase III is a water rationing program, the details of which have yet to be developed. Phase III will call for various goals of water use reduction. These goals will be established only after the effectiveness of Phases I and II have been evaluated and will include discussions with industry, community groups and other municipalities faced with similar restrictions.

### PHASE I - VOLUNTARY CONSERVATION BY CONSUMERS

### Effective Period

### General Description

Under Phase I, water consumers are asked to exercise voluntary reduction of water usage. To achieve this voluntary reduction, the Water Department requests that all water customers eliminate the unnecessary use of water, as defined in the following elements. Governmental Institutions will take a lead role in encouraging and implementing water conservation.

Commercial and industrial water users are requested to reduce water usage as far as possible without affecting their employment level. Industries are asked, in conjunction with the City, to prepare contingency plans for actions to be taken in the eventuality that continued severe drought conditions require further reductions in water use. Such contingency plans should prepare for potential eventual reductions of up to 25 percent of pre-emergency water use levels. Effort will be made to work with the industries to identify water use reduction techniques which will not affect employment level.

The consumers of City water are asked to make a conscientious effort to conserve water. The Water Department will make available water saving tips and other information to assist the consumer with their conservation effort, realizing that failure to achieve voluntary conservation will result in the imposition of a mandatory program.

These elements are declared to be unnecessary uses of water that are requested to be eliminated by all consumers of City water.

1. The use of water for irrigation and watering of lawns, gardens, landscaped areas, trees, shrubs or other plants except by hand held hose or container;

2. The use of water for washing paved surfaces such as sidewalks, driveways, parking areas, tennis courts, and patios;

3. The use of water for watering any portion of golf courses except for tees and greens;

4. The use of water for ornamental purposes including fountains, artificial water falls, and reflecting pools;

5. The use of water for non-commercial washing or cleaning of automobiles, other motor vehicles, trailers and boats;

6. The use of water for refilling swimming pools and ice skating rinks after draining;

7. The use of water from a fire hydrant for any purposes, including the use of sprinkler caps, except for fire fighting;

8. The use of water for refilling air conditioning cooling towers after draining;

9. The serving of water in restaurants, clubs or eating places unless specifically requested by a customer;

10. All leaks from any pipe, fixture or appliance on the premises of the customer;

11. The use of water for any purposes that are not reasonable or beneficial.

In addition to the above, the following uses will be eliminated by city, state and federal agencies during the emergency drought period:

12. The use of water for flushing sewers except as deemed necessary in the interest of public health and safety;

13. The use of water for flushing or washing streets, roads, driveways, sidewalks, and garages;

14. The use of water for car or truck washing and cleaning;

15. The use of fire hydrants by the City or their contractors except as necessary for fire fighting or health protection purposes.

## PHASE II - MANDATORY CONSERVATION BY CONSUMERS

### Effective Period

### General Description

Under Phase II, City water consumers are required to reduce water usage. To achieve this reduction, the City prohibits the unnecessary use of water as defined in the following elements. Governmental Institutions will also comply with these elements.

Commercial and industrial water users are required to institute their Phase II criteria of water reduction plan developed during Phase I.

The City will enforce this mandatory conservation program through the imposition of fines and possible shut off for non-compliance.

These elements are declared to be unnecessary uses of water that are prohibited for all customers using City water.

1. The use of water for irrigation and watering of lawn, garden, landscaped areas, trees, shrubs, or other plants except by hand held hose or container;

2. The use of water for washing paved surfaces such as sidewalks, driveways, parking areas, tennis courts, and patios;

3. The use of water for watering any portion of golf courses except for tees and greens;

4. The use of water for ornamental purposes including fountains, artificial water falls and reflecting pools;

5. The use of water for non-commercial washing or cleaning of automobiles, other motor vehicles, trailers, and boats;

6. The use of water filling swimming pools and ice skating rinks;

7. The use of water from a fire hydrant for any purposes (including the use of sprinkler caps) except for fire fighting;

8. The use of water for refilling air conditioning cooking towers after draining;

9. The serving of water in restaurants, clubs, or eating places unless specifically requested by a customer;

10. All leaks from any pipe, fixture or appliance on the premises of the customer;

11. The use of water to establish or construct new landscape installations;

12. The use of water for any purposes that are not reasonable or beneficial.

In addition to the above, the following uses will be eliminated by city, state, and federal agencies during the emergency drought period:

13. The use of water for flushing sewers except as deemed necessary in the interest of public health and safety;

14. The use of water for flushing or washing streets, roads, driveways, sidewalks, and garages;

15. The use of water for car or truck washing and cleaning;

16. The use of fire hydrants by the City or their contractors except as necessary for fire fighting or health protection purposes.

APPENDIX $E_2$

## SAMPLE 2
## DROUGHT WATER EMERGENCY PLAN
## WATER COMPANY

### Purpose:

This drought emergency plan is intended to establish measures for essential conservation of water resources, and to provide for equitable distribution of limited water supplies, in order to balance demand and limited available supplies and to assure that sufficient water is available to preserve public health and safety within the Company's service area.

### Objective:

It is imperative that customers within the service area achieve an immediate and further reduction in the water use in order to extend existing water supplies and, at the same time, assure that sufficient water is available to preserve the public health and sanitation, and provide fire protection service.

The objective of this drought emergency plan is to effect an immediate reduction in water usage. The amount of reduction will be determined by staff, upon review of drought conditions and remaining available supply.

### PHASE I - Early Warning Period:

The first phase shall be one of making our customers aware of an impending drought situation. The Company shall use all available news media to continually remind customers that Phase II is approaching.

### PHASE II - Voluntary Conservation By Consumers:

Under Phase II, the Company's customers are asked to exercise voluntary reduction of water usage. To achieve this voluntary reduction, the Company requests that all customers eliminate the unnecessary use of water, as defined in the following elements.

Commercial and industrial customers are requested to reduce water usage as far as possible without affecting their employment level. Industries are asked to prepare contingency plans for actions to be taken in the eventuality that continued severe drought conditions require further reductions in water use. Such contingency plans should prepare for potential eventual reductions of up to twenty-five percent (25%) of pre-emergency water use levels. Effort will be made to work with the industries to identify water use reduction techniques which will not affect employment level. These elements are declared to be unnecessary uses of water that are requested to be eliminated by all customers of the Company.

1. The use of water for irrigation and watering of lawns, gardens, landscaped areas, trees, shrubs, or other plants, except by hand-held hose or container;
2. The use of water for washing paved surfaces, such as sidewalks, driveways, parking areas, tennis courts and patios;
3. The use of water for watering any portion of golf courses, except for tees and greens;
4. The use of water for ornamental purposes, including fountains, artificial water falls and reflecting pools;
5. The use of water for noncommercial washing or cleaning of automobiles, other motor vehicles, trailers, and boats;
6. The use of water for refilling swimming pools and ice skating rinks after draining;
7. The use of water for refilling air conditioning cooling towers after draining;
8. The serving of water in restaurants, clubs, or eating places, unless specifically requested by a customer;
9. The use of water for flushing sewers, except as deemed necessary in the interest of public health and safety;
10. The use of water for flushing or washing streets, roads, driveways, sidewalks and garages.
11. The use of fire hydrants for any purpose other than fire fighting. This prohibition includes drills or practice by fire departments.

PHASE III - Mandatory Conservation By Customers:

Under Phase III, customers are required to reduce water usage. To achieve this reduction, the Company prohibits the unnecessary use of water as defined in the following elements. Governmental institutions will also comply with these elements.

The Company will enforce this mandatory conservation program through the imposition of fines and possible shut-off for non-compliance.

These elements are declared to be unnecessary uses of water that are prohibited for all customers.

1. The use of water for irrigation and watering of lawn, garden, landscaped areas, trees, shrubs, or other plants, except by hand-held hose or container;
2. The use of water for washing paved surfaces, such as sidewalks, driveways, parking areas, tennis courts, and patios;
3. The use of water for watering any portion of golf courses, except for tees and greens;
4. The use of water for ornamental purposes, including fountains, artificial water falls and reflecting pools;
5. The use of water for noncommercial washing or cleaning of automobiles, other motor vehicles, trailers and boats;
6. The use of water filling swimming pools and ice skating rinks;
7. The use of water for refilling air conditioning cooling towers after draining;
8. The serving of water in restaurants, clubs, or eating places, unless specifically requested by a customer;
9. The use of water to establish or construct new landscape installations;
10. The use of water for flushing sewers, except as deemed necessary in the interest of public health and safety;

11. The use of water for flushing or washing streets, roads, driveways, sidewalks, and garages;

12. The use of fire hydrants for any purpose other than fire fighting. This prohibition includes drills or practice by fire departments.

PHASE IV - Water Rationing:

A. Determine amount of cutback required.

B. Public notification via radio, TV, newspapers.

C. Provision of appeal mechanism by customers to State Utility Commission.

D. Monitor effectiveness of cutback.
   1. Review data on large use customers where meter is read monthly.
   2. Random check on meters of domestic customers.

E. If not effective, determine where problem areas exist.

F. Determine non-compliant customers.

G. Corrective action:
   1. Written warning.
   2. Installation of flow restriction device in service line.
   3. Shut off.

Local water rationing plans will correspond to State emergency management authority plan.

## APPENDIX F

## AD HOC COMMITTEE ON WATER USE PRIORITIES
## COMMITTEE LIST

| Members | | Representing |
|---|---|---|
| Robert E. Copeland, Chairman | Pa. | O'Brien & Gere Engineers, Inc. |
| John L. Buzzi | N.J. | Kupper Associates |
| Matthew J. Freda | N.Y. | Upper Delaware Citizens Advisory Council |
| Susan Gordon | Pa. | Morgan Lewis & Bockius |
| Robert Hanson | Del. | ICI Americas, Inc. |
| Mitchell Hunt | Pa. | Pennsylvania Economy League |
| N Lardieri/R Jensen/J Massa | Pa. | Scott Paper Company |
| Robert A. Luksa | Pa. | Philadelphia Suburban Water Co. |
| Arthur Raymond | Pa. | Sun Refining & Marketing Co. |
| Robert Richert/Jan Phillips | Pa. | GPU |
| Hershel Richman | Pa. | Cohen Shapiro Polisher Shiekman & Cohen |
| Frank Slaby/Ernest Ecker | N.J. | Hoffman-LaRoche |
| William Stenger | Pa. | Pocono Mountain Vacation Bureau |
| Bruce Stewart | Pa. | WRA/DRB |
| John Traino | N.J. | N.J. Association of Soil Conservation Districts |
| Robert Wilcox | N.Y. | National Swimming Pool Institute |
| Leon Wilkinson | Pa. | Pennsylvania Farmers Association |

| Technical Advisors | | Representing |
|---|---|---|
| Dennis Blair | Pa. | Philadelphia Water Company |
| Merrill Colmery/Jim Pitts | Pa. | Atlantic Richfield Company |
| Roland Leathrum | Del. | E.I. duPont deNemours & Co. |
| Robert Molzahn | Del. | Delmarva Power & Light Company |
| Chester Ring | N.J. | Elizabethtown Water Company |
| Leonard Rupert/Oliver Papps | N.J. | N.J. Petroleum Council |
| James Shissias | N.J. | Public Service Electric & Gas |
| David Yaeck | Pa. | Chester County Water Resources Authority |

| Ex Officio | | Representing |
|---|---|---|
| Frank Bowden | Pa. | API of Pennsylvania |
| Melvin Hoffer | Pa. | Valley Pools, Inc. |
| Hedy Margolies | Pa. | API of Pennsylvania |
| David Pollison | N.J. | Delaware River Basin Commission |
| Jeanne Prescott | Pa. | National Swimming Pool Institute |
| Jean Sinden | N.J. | Delaware River Basin Commission |

## APPENDIX G

## RESOLUTION 81-13

A RESOLUTION to establish a water use reduction advisory committee.

WHEREAS, at the request of the Commission's Executive Director, the Water Resources Association, in November 1980, appointed an ad hoc committee to advise the Commission on water use priorities in relation to the current drought; and

WHEREAS, the Water Resources Association committee submitted a report to the Commission on February 18, 1981, containing preliminary recommendations and conclusions on possible water use reduction for industry, agriculture, and municipalities, and the probable impact thereof upon production and employment; and

WHEREAS, the Commission has requested major self-supplied water users throughout the Delaware Basin to prepare water use curtailment plans; now therefore,

BE IT RESOLVED by the Delaware River Basin Commission:

1. The Commission hereby expresses its appreciation to the Water Resources Association and to the members of its Committee on Water Use Priorities for the information and suggestions that have been provided to the Commission concerning curtailment of water use during the current drought.
2. The Water Resources Association Committee on Water Use Priorities is hereby requested to continue as an advisory body to the Commission on water use reduction plans, programs, impacts and evaluations, and is hereby duly constituted for that purpose.

s/Steven J. Picco
Steven J. Picco, Chairman pro tem

s/W. Brinton Whitall
W. Brinton Whitall, Secretary

Adopted: March 25, 1981

Senator **Bradley**. I thank you very much, Mr. Stewart, for your testimony. I think it's a voice that needs to be heard.

You said you think the Federal role should be to fund planning studies. Do you see any other Federal role?

Mr. **Stewart**. I think we'd also like to see a Federal role in assisting and funding a project, as well as in the funding of studies. Right at the moment, with planning studies ending at the year 2000, there needs to be a much more long distance, far-reaching look ahead.

I think the Federal Government can provide that kind of incentive, No. 1 through policy; and No. 2, through funding.

Senator **Bradley**. My impression from your statement is that your attitude toward conservation is somewhat ambivalent. Is that right?

Mr. **Stewart**. No. I think that we find the role of conservation is clear and its benefits have been clear, but I think there are limits. We have been conserving very diligently for the last 5 years and sooner or later we're going to squeeze all the slack out of the system, and there will be nothing left in the reserve for the next emergency which we hadn't foreseen.

Senator **Bradley**. You have made a comparison between the energy crisis and water in terms of efficiency. One of the things that happened in the energy crisis was the price of oil quadrupled.

Do you think that any conservation argument that is to be persuasive would have to involve an increase in price?

Mr. **Stewart**. To some extent, I think I would agree that that's probably going to be a necessity in the future. My concern with the straight across-the-board increase price is that it nails everybody, the rich and the poor, and the big users and the small users alike.

The last study I saw on the subject was done by the U.S. Department of Commerce. That indicated, at least in terms of most of the industries, that the price of raw water would have to reach somewhere between $3 and $4 per thousand gallons before it attracted anybody's attention.

Senator **Bradley**. As opposed to 6 cents, which is it's present price?

Mr. **Stewart**. It's almost free at this time?

Senator **Bradley**. So it has a long way to go. In other words, if this is the equivalent to the oil embargo, the price of oil is now 10 cents a barrel. It's got to get to at least $14.

Mr. **Stewart**. I think the reason for that wide disparity in figures is that the cost of treatment and the cost of use of the water is so much greater than the well water cost, that that significant change has to take place.

Senator **Bradley**. You seem to disagree strongly with the 15 percent good faith reduction. You say that 10-percent reduction would lose millions of jobs.

What's your evidence for that?

Mr. **Stewart**. The report that we've included for the record was done by a committee of the Water Resources Association over a 2-year period, and using numbers provided to the DRBC by the industries themselves for the most part, reflected their assessment of what happens to their particular industry under degrees of water use restraints.

Dealing with total water reductions, I think the response was up to maybe 15 to 25 percent. A total water use reduction could be withstood for a short period of time. When it came to cutting into the consumptive use portion, the impact is very much more severe, and what the industry has reported and it's on page 7, I believe of that report—table 1 suggests that a loss of 9,000 jobs and $130 million per month of production loss at a 10-percent cut.

Higher than that, the numbers just increase dramatically.

Senator **Bradley**. I'm sorry, I need to read the study, at present I don't quite follow. If price is a major determinant and price is now at 6 cents, and it's got to go to $3 before it makes any signficant impact, then what is at issue here? If you are able to improve efficiency by 10 percent and cut consumption by 10 percent, how does that affect jobs?

Mr. **Stewart**. Because this is not imposing an efficiency constraint. This is imposing a production and water usage constraint, in that the industries are being told that they must reduce processing, packaging, whatever, beer making, whatever their particular industry might be, by reducing the amount of water, and thus the amount of product, and thus the amount of employees.

This is not an economic factor directly. The impact comes in the loss of production rather than increase in cost of water.

Senator **Bradley**. OK.

Well, one last question. Are you concerned at all with ground water or strictly interested in surface water?

Mr. **Stewart**. No, sir. Surface and ground both.

Senator **Bradley**. What do you see as the relationship between toxic chemicals and water supply questions over the next 10 years? Does that add an additional a constraint? Does that add cost?

Mr. **Stewart**. Well, I think very definitely that the quality relationship is one that gets great concern. The treatment of toxic and hazardous wastes has to be improved, otherwise we continue to jeopardize ground water supplies and make them increasingly unavailable.

The more we do that, the more constraints we impose on our ability to survive as a society.

Senator **Bradley**. OK. Thank you very much, Mr. Stewart.

Our next witnesses will be a panel consisting of Ms. Peggy Haskin of the League of Women Voters; Ms. Mary Ellen Noble, the Watershed Association of the Delaware River; Mr. Robert Owen, conservationist.

And if Mr. Simpkins is in the audience, he may join the panel at this time as well. He's the chairman of the State Grange of New Jersey.

What I'd like to do is to have you, if you could, limit your testimony to maybe 5 to 7 minutes. This way, everyone can give their testimony and then we will ask a few questions.

Let's start with Peggy Haskin. Welcome to the committee. I look forward to your testimony and your interest in the subject.

## STATEMENT OF PEGGY HASKIN, MEMBER, NATURAL RESOURCES COMMITTEE, LEAGUE OF WOMEN VOTERS OF NEW JERSEY

Ms. HASKIN. Thank you very much. What I have here will take more than 7 minutes, so I'll only read part of it and submit it for the record.

Senator BRADLEY. The full statement will be in the record.

Ms. HASKIN. I do have quite a section on New Jersey. But I will just restrict myself to the Delaware basin.

The League of Women Voters of New Jersey is very concerned with planning and management of water resources to meet State and regional needs. We have closely followed the activities of the New Jersey Department of Environmental Protection [DEP] and through our membership, the League of Women Voters and the League Council of the Delaware Basin, ILC/DRB, the activities of the Delaware Basin Commission.

In general, we have been strongly supportive of the present management and direction of both agencies.

I'll move over to page 3, paragraph 2. The league strongly supports conservation of all natural resources. We would emphasize that conservation is the quickest and most cost-effective method of increasing yield from already existing water supplies—reservoirs, pipeline, and other solutions are expensive. Ongoing conservation that is using water more efficiently and not wasting it through system or user leagues leaves more water in the reservoirs and in the ground, and thus reduces the amount of additional storage needed.

This has been recognized by DEP in their allocation of the New Jersey DEP in their allocation Water of Water Supply Bond Act money for rehabilitation of water distribution infrastructure. Similarly, reducing water use when a drought seems imminent stretches the water supply and gain lessens the amount of additional storage needed.

For instance, in the most recent drought from September 1980 to June 1981, 13 billion gallons of water was conserved—that's in New Jersey—enough to fill both the reservoirs about 11/2 times. That's a significant amount, and that was primarily in cutting down on nonessential uses.

I'm enclosing an article which I won't talk too much about here which points out the value of early reduction of water use to extend supplies.

And I'll go over to page 4. As a member of the League of Women Voters and League Council of the Delaware River Basin/ILC, we have also monitored the River Basin Commission since its creation in 1961. In 1975, in following the Federally funded Madigan-Preger Study determining whether construction on the Tocks Island Dam should proceed immediately, the leagues of the four basin States—Delaware, New Jersey, New York and Pennsylvania—concurred that Tocks Island Dam should be deauthorized. This is still our position.

Earlier that year, the Governors of the four basin States and the Federal representative to the DRBC decided the construction of Tocks Island Dam should be deferred indefinitely. DRBC's comprehensive plan, the legal guide for its operation, had been based on construction of numerous dams, with Tocks the centerpiece. With Tocks out for the foreseeable future, a new plan was needed.

A 2-year comprehensive planning study called level B, which Commissioner Weston mentioned, provided the needed data and became the basis for the present plan, the Interstate Water Management Agreement, known informally as Good faith. ILC followed the level B study very closely and in general endorsed it, particularly its emphasis on conservation and public involvement.

The league prefers nonstructural solutions to water management wherever possible. We believe that the good faith agreement, with its emphasis on conservation in drought, modest increase in storage and revised management procedures, is a significant step toward balancing the often conflicting needs of the entire basin—it isn't just one portion; it's all the way from the top to the bottom—and its service area with minimum additional storage.

We wish to comment on several items in the good faith agremeent. The agreement among the four basin States and New York City on a phased shared cutback on out-of-basin diversions and Montqague releases as water levels drop in the New York City reservoirs is exactly what is advocated in the article which I have attached.

The value of this approach, cutting back early on, is apparent when one considers that it has saved approximately 50 billions of gallons of water. This is different from Commissioner Weston's figure. I just got it day before yesterday from the DRBC. We're up to 50 billion gallons of water in the New York City reservoirs from the time the DRBC declared a drought warning in January 1985 to the present time.

As a frame of reference, this is almost sufficient to fill Round Valley, NJ, largest reservoir. This is a sizable amount of water, and this is primarily nonessential uses because of New York City. To the best of our knowledge, the depleted water use budget now in preparation at DRBC—this is part of good faith—is the first basinwide attempt anywhere to correlate water allocation with available supplies.

We have endorsed it wholeheartedly. The League believes that the user should pay the true cost of the resource, in this case water. We favor the modification of existing dams for additional water supply, for construction of major new projects, and support the principle of the user paying for their modification. In order for all of the users in the basin to contribute to support of the modification, grandfather provisions for cost-free water for precompact users must be removed. These are set forth in the Federal reservation 15.1(b).

The commission is presently considering this modification. It has held information meetings around the basin for public input on the matter.

ILC stated that it favored modification of 15.1(b). We believe that all substantial water users in the basin should pay for their water supply, both surface and ground, with a possible exception for agriculture.

We wish to point out that DRBC is providing leadership in comprehensive ground water management within the basin. In 1988, established the ground water protected area in southeastern Pennsylvania for better control of overstressed supplies. Long-term ground water management depends on detailed knowledge of the occurrence of ground water and its movement from zones of recharge to zones of discharge.

This data is not yet available. DRBC is working for the four States for a unified source of organized and readily retrievable hydrogeologic data throughout the basin. This is a farsighted and valuable program that deserves full support. It is also attracting national interest, as it could serve as a model for a common data base for collecting and storing water data.

In summary, we believe that both New Jersey DEP and DRBC are moving steadily in the right direction in their management of a finite resource. The value of conservation, both ongoing and in drought, is gaining increasing recognition. Protection of ground water supplies, both quantity and quality, is of paramount importance. Actually, we are discovering that we can use our ground water conjunctively with surface water in this way, protecting the ground water, and yet increase the yield.

We feel that both DEP and DRBC are addressing this matter of ground water management and urge that it continue to receive major attention. Also, the league strongly supports public participation involvement, and we believe that both agencies are reaching out for public input into the regulation and policies.

I have a section on what I think the Federal Government could do. Should I read that?

Senator **Bradley**. Yes, please do.

Ms. **Haskin**. Despite the fact that it's one more page, there are several suggestions as to how Federal support and resources might be helpful in assuring an adequate water supply for New Jersey and the Delaware River basin:

One, Federal support for water projects. This region has a number of older cities with deteriorating distribution systems. The Corps of Engineers has contributed its expertise to assist in planning for their rehabilitation, but funds to carry out the projects are often not available. Repairing badly leaking systems is much quicker and less costly payback in water supply than a new reservoir. Some acceptable and attractive method of up-front financing should be available for this purpose.

Additionally, in the case of flow augmentation in the Delaware Basin, modification of the two flood control dams, Walter and Prompton, would provide adequate water in a far shorter period than the proposed Tocks Island Dam and at far less environmental cost. Where such modifications can fill water supply needs, every effort should be made to encourage them, rather than stretch a major reservoir project like Tocks, which we felt is overkill.

Two, as indicated above, the league believes that the user should pay the true cost of the resource, and we support the modification of the Federal reservation to the compact 15.1(b), which provides cost-free water to precompact users. If the Commission votes unanimously to modify 15.1(b), congressional action will be needed to accomplish the modification.

[The prepared statement of Ms. Haskin follows:]

**LEAGUE OF WOMEN VOTERS OF NEW JERSEY**
204 WEST STATE STREET, TRENTON, NEW JERSEY 08608 / TELEPHONE 1-800-792-VOTE / 609-394-3303

### TESTIMONY TO THE
### UNITED STATES SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
### SUBCOMMITTEE ON WATER AND POWER

August 7, 1985 at Cherry Hill, N.J.
Presented by Peggy Haskin, member, Natural Resources Committee, LWVNJ

The League of Women Voters of New Jersey has long been concerned with planning and management of water resources to meet state and regional needs. We have closely followed the activities of the New Jersey Department of Environmental Protection (DEP) and, through our membership on the League of Women Voters Inter-League Council of the Delaware River Basin (ILC/DRB), the activities of the Delaware River Basin Commission (DRBC). In general, we have been strongly supportive of the present management direction of both agencies.

When the 1980-81 drought hit, New Jersey was already underway toward responsible management of its water resources - with an almost completed water supply master plan and a resolve to implement it. The drought accelerated this planning and also initiated new legislation based on master plan findings: (1) new regulatory powers for DEP (the 1981 Water Supply Management Act); (2) establishment of the N.J. Water Supply Authority to take over the duties of DEP's Division of Water Supply - that is, operation of state-owned water facilities (Round Valley, Spruce Run and the Delaware & Raritan Canal) and construction of many new state projects; (3) authority to take over inefficient small water companies. The drought also sparked the passage of a $350 million Water Supply Bond Act to implement the new master plan.

Since that time we have followed the implementation of the water supply master plan and believe that the DEP is moving responsibly to carry out its provisions. We are particularly supportive of a unique feature of the 1981 Water Supply Bond Act - the provision for the first time to use funds for studies to provide basic data and information for DEP's guidance in managing the state's water more effectively. Previous bond acts only allowed feasibility and engineering studies for projects already on the books. We believe the new approach will provide sorely needed information on aquifer and watershed protection, comprehensive evaluation of polluted wellfields, in-depth ground water studies, etc. For instance, the Bond

(more)

Act is funding on a matching basis with the U.S. Geological Survey (USGS) a long-term ground water study in various critical areas of the state. Since 50% of the people in New Jersey rely on ground water, the importance of such a study is significant.

Although none of the new major water supply projects underway since the 1981 drought are completed, we believe that the state is far better prepared for drought than we were four years ago. Not only are new interconnections in place in Northeast New Jersey, but there are important institutional and regulatory changes. A drought contingency plan has been prepared and adopted and is now being followed. The regulations implementing the 1981 Water Supply Management Act were finally adopted this past March after extensive public review. They give DEP real control over the use and abuse of water supplies by such means as declaring "critical" areas where ground water is being mined, by holding water purveyors to their safe yield and by requiring system maintenance to reduce water loss through leaks. The potential of these new regulations is not yet fully realized, but we believe that they could assure a long-term improvement in the reliability of New Jersey's water resources.

There have been questions as to why the Raritan-Passaic pipeline, listed in the water supply master plan for immediate action, has not been built. Such a pipeline could carry water from Round Valley (the state's largest reservoir) to the Raritan Basin to the Northeast. In the 1980-81 drought it would have been invaluable, and, had the drought continued, would probably have been built. However, strong opposition from a number of sources led DEP to retain consultants for an exhaustive study on future water needs for Northeast New Jersey. The League of Women Voters of New Jersey had representation on the Advisory Committee for this study. The final report stated that, from now to the year 2000, water needs for the Northeast would slowly decline, whereas in the area served by the Round Valley-Spruce Run-Delaware and Raritan Canal System (Raritan Basin), they would grow correspondingly.

Furthermore, a major water supply project for Northeast New Jersey - Wanaque South - was already well under construction by the Hackensack Water Company and the North Jersey District Water Commission. This project, together with an adjoining reservoir at Monksville also now under construction, will provide approximately an additional 80 million gallons a day (mgd) of water for Northeast New Jersey - roughly equivalent to the amount available in Round Valley Reservoir. With the completion date for Wanaque South expected in early 1986, it appeared that the Raritan-Passaic pipeline was not needed at this time. We concur.

(more)

Even without the pipeline, by means of interconnections completed or initiated in the 1980-81 drought, it is now possible to get significant amounts of water from the Round Valley-Delaware System into Northeast New Jersey on an emergency basis. Elizabethtown Water Company's interconnection with Newark has been increased from roughly 15 mgd to 35 mgd. Delaware Basin water which would normally have reached central New Jersey through the Delaware and Raritan Canal can be diverted to Northeast New Jersey via Lake Hopatcong (25 mgd) and via the pipeline across the George Washington Bridge (20 mgd). These three interconnections total 60 mgd - a substantial amount when one considers that the additional 80 mgd to be provided by the Wanaque South-Monksville project will satisfy Northeast New Jersey's needs for some time.

The League strongly supports conservation of all natural resources. We would emphasize that conservation is the quickest and most cost-effective method of increasing yield from already existing water supplies. Reservoirs, pipelines and other structural solutions are expensive. Ongoing conservation, that is, using water more efficiently or not wasting it through system or user leaks, leaves more water in the reservoirs and in the ground, and thus reduces the amount of additional storage needed. This has been recognized by DEP in their allocation of Water Supply Bond Act money for rehabilitation of water distribution infrastructure. Similarly, reducing water use when a drought seems imminent, stretches the water supply, and again lessens the amount of additional storage needed. For instance, in the most recent drought from September, 1980 to June, 1981, 13 billion gallons of water was conserved - enough to fill Boonton Reservoir about 1½ times.

Early reduction of water use to extend supplies when a drought seems possible is strongly advocated in an article "Drought and Water Supply in the 1980s," published in RESOURCES, October, 1981, pages 6 and 7 (copy attached). Based on two studies, one of the 1960s drought in Massachusetts funded by Resources for the Future and the other a U.S. Corps of Engineers' study of the same event in York, Pa., the article concludes that "municipal water systems should be designed so that, at the margin, the cost of increasing capacity is equal to the expected damages avoided by that addition. Because total expected damages usually can be reduced by intelligent and foresighted application of restrictions before there is a physical need for them, the expected damage estimates should be developed by costing the effects of programs of staged drought response, which include gradually tightened restrictions." This approach has been the one taken by DEP in its handling of the present drought. Early action by DEP, banning non-essential water uses while there was still enough

(more)

water left to conserve, has resulted in significant savings. As of now this timely action appears to have headed off severe restrictions for all users.

As a member of the League of Women Voters Inter-League Council of the Delaware River Basin (ILC/DRB), we have also monitored the Delaware River Basin Commission (DRBC) since its creation in 1961. In 1975, following the federally-funded Madigan-Preger study to determine whether construction on Tocks Island Dam should proceed immediately, the Leagues of the four Basin states (Delaware, New Jersey, New York, and Pennsylvania) concurred that Tocks Island Dam should be deauthorized. This is still our position.

Earlier that year the governors of the four Basin states and the federal representative to DRBC had decided that construction of Tocks Island Dam should be deferred indefinitely. DRBC's Comprehensive Plan (the legal guide for its operation) had been based on construction of numerous dams with Tocks the centerpiece. With Tocks out for the foreseeable future, a new plan was needed. A two-year comprehensive planning study, called Level B, provided the needed data and became the basis for the present plan - "The Interstate Water Management Agreement," known informally as "Good Faith." ILC/DRB followed the Level B Study very closely, and in general endorsed it, particularly its emphasis on conservation and public involvement.

The League prefers nonstructural solutions to water management, wherever possible. We believe that the "Good Faith" Agreement, with its emphasis on conservation in drought, modest increase in storage and revised management procedures is a significant step towards balancing the often conflicting needs of the entire Basin and its service area with minimum additional storage.

We wish to comment on several items in the "Good Faith" Agreement. The agreement among the four Basin states and New York City on a phased shared cut-back on out-of-basin diversions and Montague releases as water levels drop in the New York City reservoirs is exactly what is advocated in the previously cited article, "Drought and Water Supply in the 1980s." The value of this approach is apparent when one considers that it has saved approximately 50 billion gallons of water in the New York City reservoirs from the time that DRBC declared a drought warning in January 1985, to the present time. This is almost sufficient to fill Round Valley, New Jersey's largest reservoir.

To the best of our knowledge the depletive water use budget, now in preparation at DRBC, is the first basinwide attempt anywhere to correlate water allocation with available supplies. We have endorsed it wholeheartedly.

(more)

The League believes that the user should pay the true cost of a resource, in this case water. We favor the modification of existing dams for additional water supply over construction of major new projects and support the principle of the user paying for their modification. In order for all the users in the Basin to contribute to the support of the modification, grandfather provisions for cost-free water for pre-compact users must be removed. These are set forth in Federal Reservation 15.1 (b) to the Compact. The Commission is presently considering modification of 15.1 (b) and has held information meetings throughout the Basin for public input on the matter. ILD/DRB stated that it favored modification of 15.1 (b). We believe that all substantial water users in the Basin should pay for their water supply, both surface and ground, with possible exceptions for agriculture.

We wish to point out that the DRBC is providing leadership in comprehensive ground water management within the Basin. In 1980 it established the Ground Water Protected Area in Southeast Pennsylvania for better control of overstressed supplies. Long-term ground water management depends on detailed knowledge of the occurrence of ground water and its movement from zones of recharge to zones of discharge. This data is not yet available. DRBC is working with the four states for a unified source of organized and readily retrievable hydrogeologic data throughout the Basin. This is a far-sighted and valuable program and deserves full support. It is also attracting national interest, as it could serve as a model for a common data base for collecting and storing water data.

In summary, we believe that both New Jersey DEP and DRBC are moving steadily in the right direction in their management of a finite resource. The value of conservation, both ongoing and in drought, is receiving increasing recognition. Protection of ground water supplies, both quantity and quality, is of paramount importance. We feel that both DEP and DRBC are addressing this matter and urge that it continue to receive major attention. Both agencies are reaching out for public input into new regulations and policies.

We have several suggestions as to how federal support and resources might be helpful in assuring an adequate water supply for New Jersey and the Delaware River Basin.

(1) Federal Support for Water Projects. This region has a number of older cities with deteriorating distribution systems. The Corps of Engineers has contributed its expertise to assist in planning for their rehabilitation, but funds to carry out the projects are often not available. Repairing badly leaking systems

(more)

gives much quicker and less costly payback in water supply than a new reservoir. Some acceptable and attractive method of up-front financing should be available for this purpose. Additionally, in the case of flow augmentation in the Delaware Basin, modification of two flood control dams (Walter and Prompton) would provide adequate water in a far shorter period than the proposed Tocks Island Dam and at far less environmental cost. Where such modifications can fill water supply needs, every effort should be made to encourage them rather than construction of a major reservoir project like Tocks, which we feel is "overkill."

(2) As indicated above, the League believes that the user should pay the true cost of a resource, and we support the modification of the Federal Reservation to the Compact 15.1 (b), which provides cost-free water to pre-compact users. If the Commission votes unanimously to modify 15.1 (b), Congressional action will be needed to accomplish the modification.

(3) Ground Water Protection. Protection of ground water quantity and quality we believe should be a national priority. Federal legislation providing funds is a necessary ingredient of controlling contamination, particularly from leaking landfills. Ground water quantity has not generally received as much attention as quality. Unlike surface water its overuse has not been obvious. There has also been a lack of public recognition of the interrelation between the two. Ground water maintains streamflows between periods of precipitation and provides a major portion of the flow of perennial streams.

The efforts of both DEP and DRBC to protect ground water supply would be greatly assisted by increased federal support for the U.S. Geological Survey. Long-term dependable data on stream flows and ground water levels are essential for informed management of the resource, but obtaining uniform comprehensive and definitive data is often too costly for state and regional agencies; therefore, they look to USCS for back-up. For instance, the extensive data gathered by the USGS in New Jersey's Monmouth and northern Ocean Counties made it possible for DEP to designate this as the first "critical" area in its new ground water management program. Attached is the information leaflet, based on USGS data, prepared to explain to lay citizens why their area is being declared "critical" and why they will have to cut back their ground water withdrawals.

(more)

We believe that further data is needed by DEP to enable protection of the ground water recharge areas as well as to identify problems in other aquifers before they reach the "critical" stage. USGS assistance is key to such a program, and continued support for the USGS water use program is essential for both New Jersey and the Delaware River Basin.

# Drought and water supply in the 1980s

ONE WOULD BE cloistered indeed not to have noticed that over the past year or so less than normal precipitation has characterized much of the continental United States.

Crops and water supplies are threatened. For example, 1980 yields for several crops (including corn and peanuts) were reduced by the heat wave and dry spell that baked the Midwest and South, and last winter's snowpack in the western mountains was one of the lightest ever recorded. And to the north and east of the Delaware Valley, restrictions on water use, imposed last fall and winter after one of the driest summers on record, remained in effect well into 1981.

These events so moved the editors of *Newsweek* that their February 23 cover depicted an outline of the forty-eight contiguous states filled in their entirety with drought-parched earth. And inside, the feature story reflected the cover art. *U.S. News and World Report* devoted its June 29 cover story to water scarcity, and many other publications, from the revivified *Life* to *Organic Gardening*, also have given cover treatment to the issue. Thus, the "drought" of 1980–81 afforded the media promising material for analysis, as well as a basis for gloomy predictions.

Nowhere has this theme been more enthusiastically pursued than in the Northeast, particularly in New York, where the national newspapers and television networks have made much of regional and nationwide droughts. This could be considered harmless, except that under the dual stresses of actual precipitation shortfalls and hectoring newspaper and TV stories, water system managers and municipal and federal agency officials may commit themselves to unwise projects or policies.

To better understand the potential for distortion, it is useful to review what is known about the 1980 drought in the urbanized Northeast; how it was analyzed in the press, especially by *The New York Times;* and how that analysis reinforces traditional approaches that are biased toward expensive increments to water-system capacity.

*The 1980 drought.* Precipitation shortfalls, even when regionwide, vary in intensity so that no single set of measurements captures *the* regional experience. But some easily available measures show that the 1980–81 water shortage really was severe in the Northeast. For example, New York City's total precipitation for the three summer months of 1980 was 3.42 inches, the lowest ever recorded and, as significant, more than 20 percent lower than the second driest summer, that of 1916.

The summer of 1980 also was one of the hottest on record, increasing the demand for water for pools, commercial air conditioning, lawn irrigation, and fire hydrant sprinklers. The combination resulted in more rapid than normal reservoir drawdown (see figure 1). And as the dry spell continued into the fall, the reservoir levels kept falling, producing a percentage-of-capacity trace for the giant New York City system that approximated, until mid-February 1981, that of 1964 and 1965—the two worst years of the mid-1960s drought.

As reservoir levels fell in the fall and winter, one water system after another announced drought alerts, warnings, and emergency situations, and imposed restrictions on car washing; hosing down streets, driveways, and sidewalks; and operating ornamental fountains. To publicize restrictions, restaurants were asked to serve water only on request; and a great deal of advice was offered about showering, shaving, flushing, and dishwashing.

In some parts of northern New Jersey and southwestern Connecticut an attempt was made to enforce real rationing by limiting household connections to 50 gallons per capita per day, by increasing meter reading frequency, and by applying either criminal penalties or water surcharges to those who appeared to be in violation.

These measures gave one a sense of *déjà vu*, since they were the same as those imposed during the several drought years of the 1960s. Granted, some lessons had been learned from the California experience of the late 1970s about how far authorities could push people to change their habits in such sensitive areas as toilet-flushing, but no water systems had installed remotely read meters or other technological innovations that would increase the feasibility of a truly effective rationing scheme.

*"Drought" perspective.* The drought of the 1960s, a much more severe event overall than the 1980–81 dry spell, came almost immediately after New York City's water system had completed its three Delaware watershed reservoirs. The system's "safe yield"—that quantity of water deliverable every day in all but 5 percent of years (based on what then was the worst drought on record)—was then about 1.55 billion gallons per day. With consumption averaging about 1.2 gallons per day, then-Commissioner D'Angelo might be forgiven his impetuous statement, made in January 1961, that the city would never again experience a water shortage. As the drought years followed each other, however, the existence of new reservoirs discouraged the media from blaming inadequate planning and insufficient investment for the shortage of water. It seemed clear, even to the *Times*, that this was a natural event so severe that it overwhelmed the most ambitious of plans and the most generous of investment programs.

In 1980–81 the city's physical capacity is the same as in the 1960s, but water withdrawals from it on an average day now are about 1.5 billion gallons, close to safe yield. Other systems in the region are in similar shape, whether because of en-

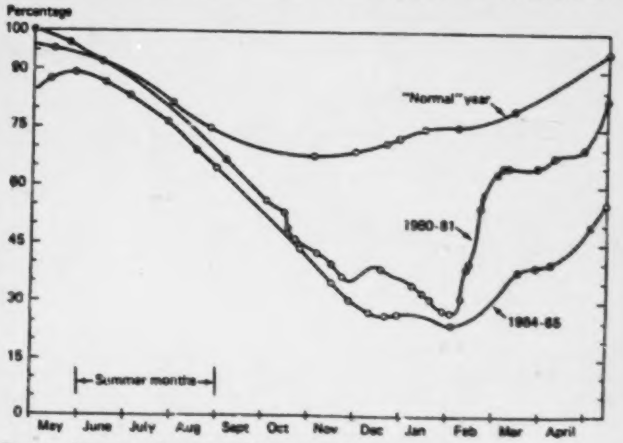


Figure 1. Percentage of capacity held in New York City reservoirs.

vironmental objections to the construction of new reservoirs or because investments in new sources were postponed as a result of budget constraints. (In northern New Jersey two reservoirs had been built by the state after the 1960s drought, but they are not connected to the water systems that had problems in 1980–81.)

This left an irresistible opening for the media analysts. In February 1981 the *Times* stated that the need for water use restrictions "has raised the question why something was not done to prevent the shortages, especially when water resource experts were saying that even in times of drought there was plenty of water in the region for all essential uses." There followed some agitation for measures to "prevent" shortages, but media skeptics were not sanguine that citizen concern would survive the end of the drought, whenever that came.

*Some observations about droughts, shortages, and expansion of water system capacity.* The quotation from the *Times* captures the essence of a polar view of municipal water system planning: shortages are unacceptable, and capacity should always be large enough, relative to demand, to prevent them. This view is based on comprehensive misunderstanding, and attempts even to approximate its implications for investment are bound to be enormously expensive—perhaps even infeasible in the heavily populated Northeast.

Fundamentally, it is impossible to prevent shortages because, short of zero, there is no lower limit to possible precipitation over any given period. No matter how much storage capacity is provided, a natural event can make it impossible to meet all demands at whatever price normally is charged.

Second, shortages do not fit the characteristics implicit in the no-shortage position. Except in the kind of extreme situation that is experienced only very rarely and usually by systems without any significant storage, shortages do not arise from an actual lack of water. Shortages are "created" by system managers who impose water-use restrictions long before their reservoirs go dry, precisely in order to prevent that from happening. This is done because their own intuition and the best available evidence say that damages are a steeply nonlinear function of shortage size. Thus, if there is overperiod storage in the system, and if it seems likely that in one period the available supply might be as much as 30 percent below demand, it often seems prudent to "save" 10 percent over each of three periods, rather than 30 percent in one period.

Given almost complete uncertainty about weather conditions for more than five days ahead, no one knows when it will be necessary to reduce withdrawals by 30 percent. In retrospect, it often proves unnecessary to have imposed restrictions on use: it usually rains enough to have supported normal use. But not always—and in a multiyear drought the system could court trouble by forecasting such a happy ending. Hence risk-averse managers create shortages, even though enough water may be physically available.

Also, while shortages may be annoying and even psychologically disturbing to some people, they have quite modest economic effects until they become very large indeed. Pseudo shortages almost always begin by involving restrictions on such uses as car washing and pavement cleaning, surely nonessential tasks by any reasonable view. Even restrictions on watering lawns and shrubs cost consumers little unless the precipitation shortfall is severe enough to kill valuable trees or shrubs. Restrictions on commercial activity usually involve only nonrecycling systems and can easily be avoided by modest investments (some of which should perhaps have been made in any event).

Some data on drought losses from an RFF-funded study of the 1960s drought in Massachusetts, and a U.S. Corps of Engineers' study of the same event in York, Pennsylvania, produced estimates of losses as connected to reductions in water use (percentage "shortages"). See table 1.

Table 1. Some Annual Drought Damage Estimates

| | Percentage of shortage | | | |
|---|---|---|---|---|
| Damages in 1979 dollars | 10 | 14 | 22 | 30 |
| Worst assumptions[a] | $11.20 | $22.90 | $8.40 | $10 |
| Best assumptions[a] | 10.60 | 3.10 | 7.10 | 21 |

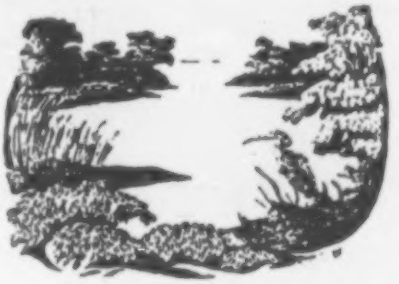
*Sources:* Data for the 10, 14, and 22 percent shortages reflect the experience of three Massachusetts cities and are taken from Clifford S. Russell, David G. Arey, and Robert Kates, *Drought and Water Supply: Implications of the Massachusetts Experience for Municipal Planning* (Baltimore, Md., Johns Hopkins University Press for Resources for the Future, 1970); data for the 30 percent shortage are from G. K. Young, R. S. Taylor, and J. J. Harris, *A Methodology for Assessing Economic Risk of Water Supply Shortages* (Institute for Water Resources, Department of the Army, Corps of Engineers, 1973).

[a] The assumptions involve such things as applicable interest rates, the extent to which "lost" production or sales are made up later, and the appropriate accounting stance, whether local or national. The estimates of both studies have been inflated to 1979 dollars using the Consumer Price Index.

In short, the appropriate response to pervasive uncertainty about future precipitation levels is planning to have shortages and *not* planning to prevent them. That is, municipal water systems should be designed so that, at the margin, the cost of increasing capacity is equal to the expected damages avoided by that addition. Because total expected damages usually can be reduced by intelligent and foresighted application of restrictions before there is a physical need for them, the expected damage estimates should be developed by costing the effects of programs of staged drought response, which include gradually tightened restrictions.

This is, in fact, the approach that has been taken by the Washington (D.C.) Suburban Sanitary Commission in deciding on its latest increment to capacity. For the sake of New York and New Jersey residents, one can hope that this is the lesson drawn from the 1980 drought, and not the one that has been portrayed by the news media.

*The above article was written by Clifford S. Russell, director of RFF's Quality of the Environment Division.*



# GROUNDWATER

## WHAT IS HAPPENING BENEATH MONMOUTH COUNTY AND NORTHERN OCEAN COUNTY?

MANASQUAN
RESERVOIR SYSTEM

NEW JERSEY
WATER SUPPLY AUTHORITY

Metcalf & Eddy, Inc.
Woodward-Clyde Consultants
New Jersey First, Inc.
Holt & Ross, Inc.
Arthur Young & Company

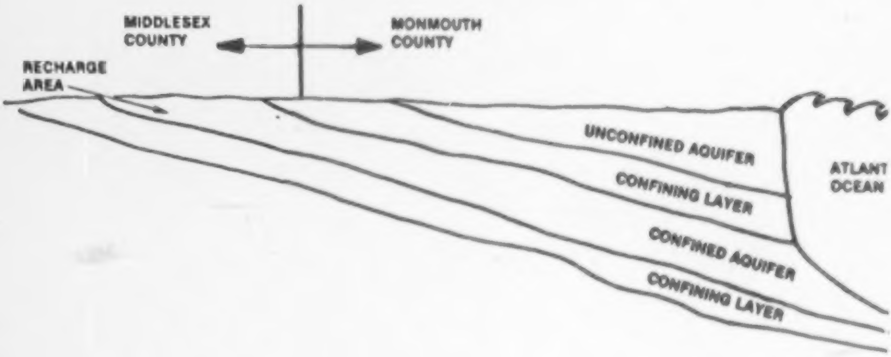
# Introduction

The purpose of this report is to give a basic understanding of the aquifers that lie beneath the Monmouth County area and what happens to these aquifers as water is withdrawn from them. This report will use illustrations to show:

- What aquifers are;
- How they store water;
- What happens when water is withdrawn from them.

This report also shows the effect that withdrawal of large amounts of water is having on one of the major aquifers, the Englishtown aquifer, that serves the Monmouth-Ocean County area. Similar information is provided for a part of the Raritan Magothy aquifer.

## Typical geometry of a confined aquifer


MIDDLESEX COUNTY
MONMOUTH COUNTY
RECHARGE AREA
UNCONFINED AQUIFER
CONFINING LAYER
CONFINED AQUIFER
CONFINING LAYER
ATLANT OCEAN

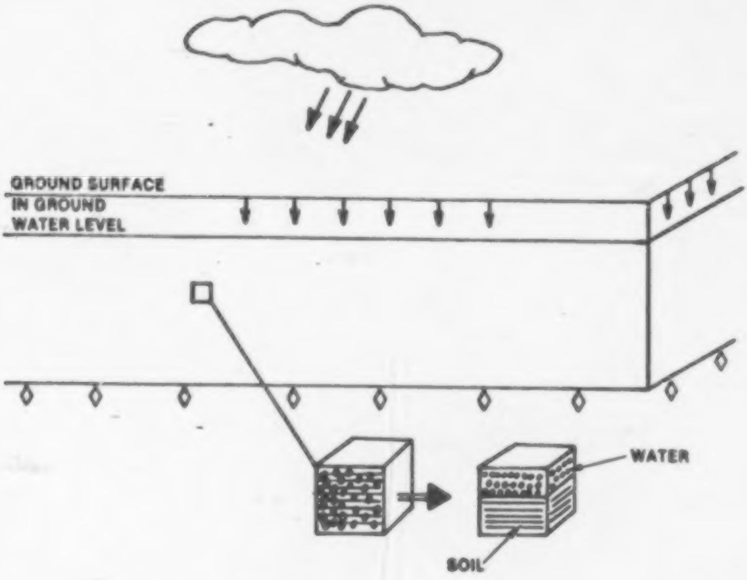
Aquifers are nothing more than underground reservoirs which store water that seeps below ground after it rains. Aquifers come in two types: "confined" and "unconfined."

**Unconfined** aquifers are those that lie on the surface and are often referred to as the "water table." They are sandy, gravelly deposits that contain water. This water can sometimes be reached by shallow wells and often appears in holes dug in these deposits.

**Confined** aquifers typically start at a point on the surface and slope downward, reaching very deep underground. They are layers of soil that contain water and are usually sandwiched between other layers of soil, such as clay, that are relatively impermeable — that is, water passes through them very slowly, if at all.

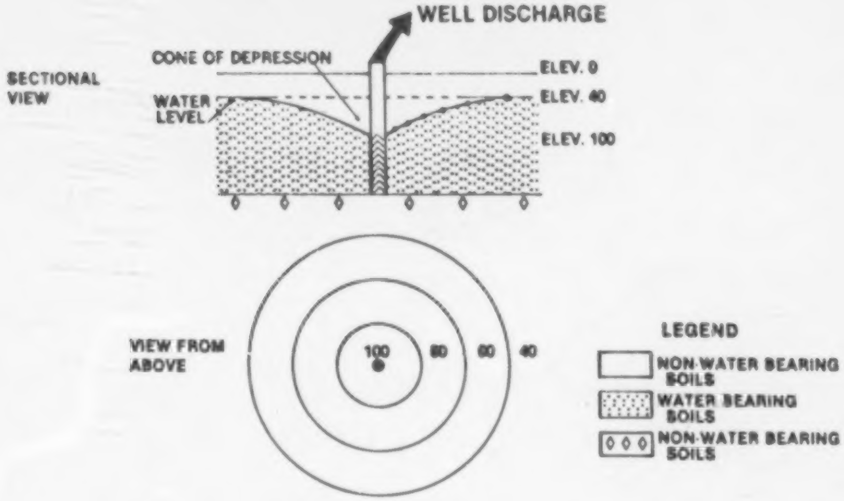
Aquifers receive most of their water from rainfall. Unconfined aquifers receive their rainwater over large, widespread areas. Confined aquifers, on the other hand, can only receive water at those points of limited area where they emerge from the ground. These natural "recharge" areas, as they are called, usually occur as strips of ground that typically cross township and county boundaries.

## Storage of rainfall in underground reservoirs


GROUND SURFACE
IN GROUND
WATER LEVEL
WATER
SOIL

When rainfall enters the surface aquifers, or the recharge areas of confined aquifers, it percolates downward as far as necessary to fill the lower areas in the aquifer that have no water. Thus, if a block of aquifer soil was examined, it would be found to consist of a mixture of soil and water.

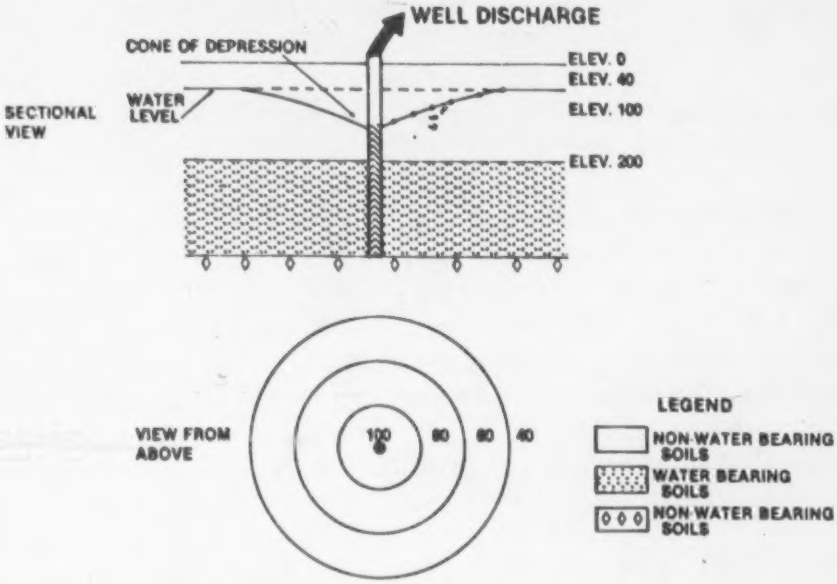
**Pumping from a water table aquifer**


WELL DISCHARGE
SECTIONAL VIEW
CONE OF DEPRESSION
WATER LEVEL
ELEV. 0
ELEV. 40
ELEV. 100
VIEW FROM ABOVE
100
80
60
40
LEGEND
NON-WATER BEARING SOILS
WATER BEARING SOILS
NON-WATER BEARING SOILS

This picture shows what happens when water is removed from a surface aquifer. As water is drawn from the well, other water moves through the earth as nature attempts to refill the zone from which water was removed. The well's operation causes the water table to decline not only in the vicinity of the well, but in adjacent areas as well. The level of decline falls off as the distrance from the well increases.

If an unused well was located next to the working well, its water level would be affected by the operation of the working well. A series of inactive wells could be used to measure this effect of the working well. When these levels are measured and plotted on a graph, they would produce a picture like the one on this page. The plotted water levels would look like a cone. In fact, they are called "cones of depression." Lines of constant water level — which actually occur as a series of concentric circles — can also be plotted on a map to show the extent of those cones of depression.

## Pumping from a confined aquifer


WELL DISCHARGE
CONE OF DEPRESSION
ELEV. 0
ELEV. 40
WATER LEVEL
SECTIONAL VIEW
ELEV. 100
ELEV. 200
VIEW FROM ABOVE
100
80
60
40
LEGEND
NON-WATER BEARING SOILS
WATER BEARING SOILS
NON-WATER BEARING SOILS

The picture above shows what happens when water is removed from confined aquifers — the ones that are typically located deep underground. These aquifers often contain water that is under pressure, especially when they are tapped deep in the ground, far from the place where they are recharged by rainfall. In those cases, this hydrostatic pressure can actually raise the water level above the top of the soil layer that contains the water.

As in the previous illustration, the water drawn from the area around the well is replaced by water that moves to refill the space from which the water was removed; water then moves to replace that water, and so on. As a result, the water level declines near the well and throughout the rest of the aquifer, with the levels of greatest decline occurring closest to the active well.

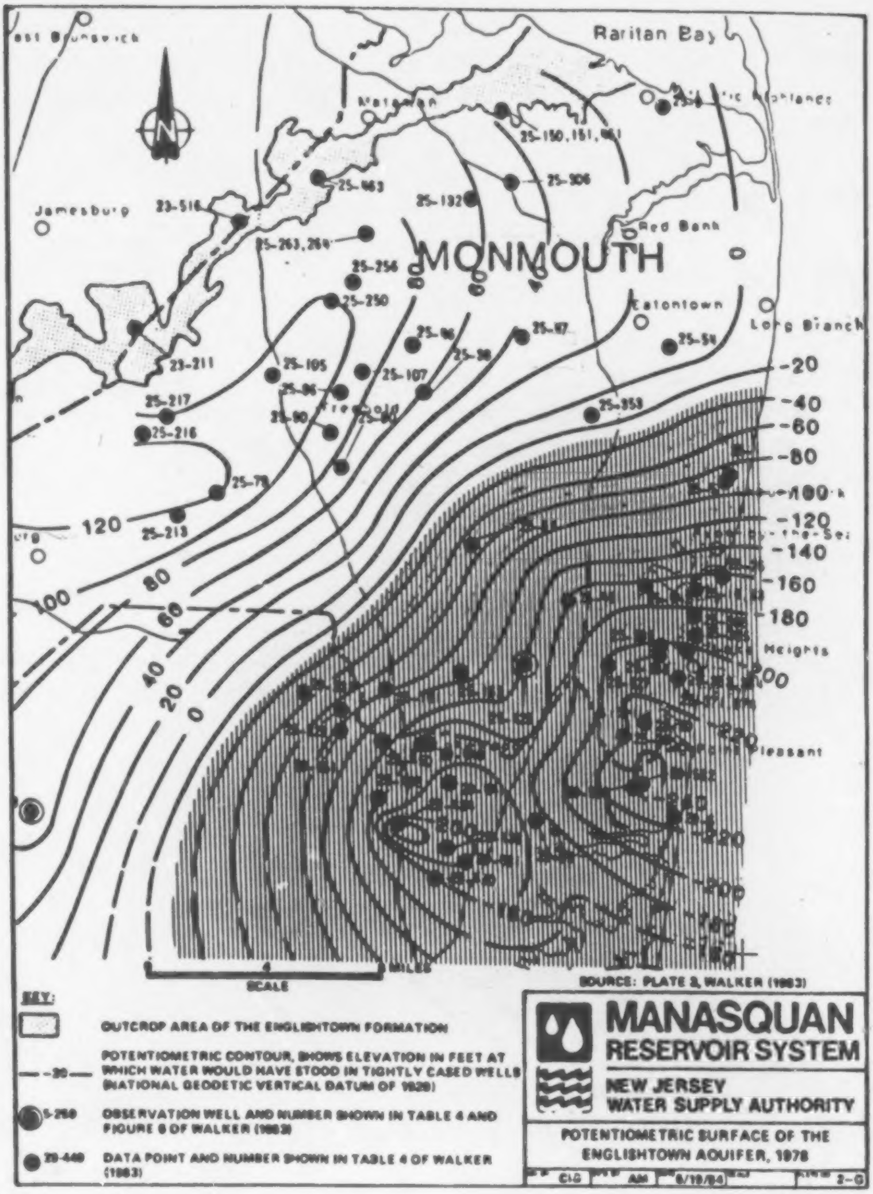
Here again, an unused well adjacent to an active well would be affected by the working well. If several of these idle wells were present, they could be used to plot and map the varying water levels and the locations of the rings of constant water level in the aquifer. By doing this, the plots would show where the cones of depression are.

In fact, this is the method used by the United States Geologic Survey (USGS) to measure water levels and map the rings of constant water level in aquifers. There are numerous wells in Monmouth County and Ocean County that are used to measure water levels in the aquifers that lie beneath this region. This water level information is collected and mapped every five years.

The following maps show rings of equal water level in one of the aquifers that lies beneath the Monmouth-Ocean area — the Englishtown aquifer. This is one of the more heavily used aquifers in the region. The map shows that in 1978, water levels in this aquifer in the Point Pleasant area were more than 240 feet below sea level. The ring that represents a water level of 100 feet below sea level runs from Asbury Park to a location south of Freehold Township. The ring that represents the aquifer water level at sea level runs from Eatontown through Freehold Township and into Jackson Township in Ocean County.

When aquifer water levels are lowered to the extent shown by these USGS maps, they become vulnerable to contamination. This contamination can come from the water that moves into the aquifer from its recharge area or it can come in the form of salt water that enters the aquifers from the ocean. In addition, as water levels decline, wells run out of water and must either be drilled deeper or be moved further inland, where water levels are not as depressed.

This has already been happening in Monmouth County, where some communities along the coast are finding that the chloride levels (a measure of the amount of salt in the water) are increasing on a regular basis. In fact, some communities have had to move their wells inland to escape the salt water that is entering their underground water supplies. Other communities in Monmouth County have had to drill deeper wells, and in some cases have even had to change aquifers, in order to find enough water to meet their present water needs.


Raritan Bay
Matawan
Atlantic Highlands
Jamesburg
Red Bank
MONMOUTH
Eatontown
Long Branch
Freehold
Point Pleasant
N
25-150, 151, 161
25-306
25-463
25-132
23-516
25-263, 264
25-256
25-250
25-46
25-87
25-58
25-105
25-107
25-38
23-211
25-86
25-217
25-90
25-216
25-353
25-79
25-213
120
100
80
60
40
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
0
4
8 MILES
SCALE

SOURCE: PLATE 2, WALKER (1983)

KEY:

▨ OUTCROP AREA OF THE ENGLISHTOWN FORMATION

— -20 — POTENTIOMETRIC CONTOUR, SHOWS ELEVATION IN FEET AT WHICH WATER WOULD HAVE STOOD IN TIGHTLY CASED WELLS (NATIONAL GEODETIC VERTICAL DATUM OF 1929)

● 25-250 OBSERVATION WELL AND NUMBER SHOWN IN TABLE 4 AND FIGURE 8 OF WALKER (1983)

● 29-440 DATA POINT AND NUMBER SHOWN IN TABLE 4 OF WALKER (1983)

MANASQUAN
RESERVOIR SYSTEM
NEW JERSEY
WATER SUPPLY AUTHORITY

POTENTIOMETRIC SURFACE OF THE ENGLISHTOWN AQUIFER, 1978

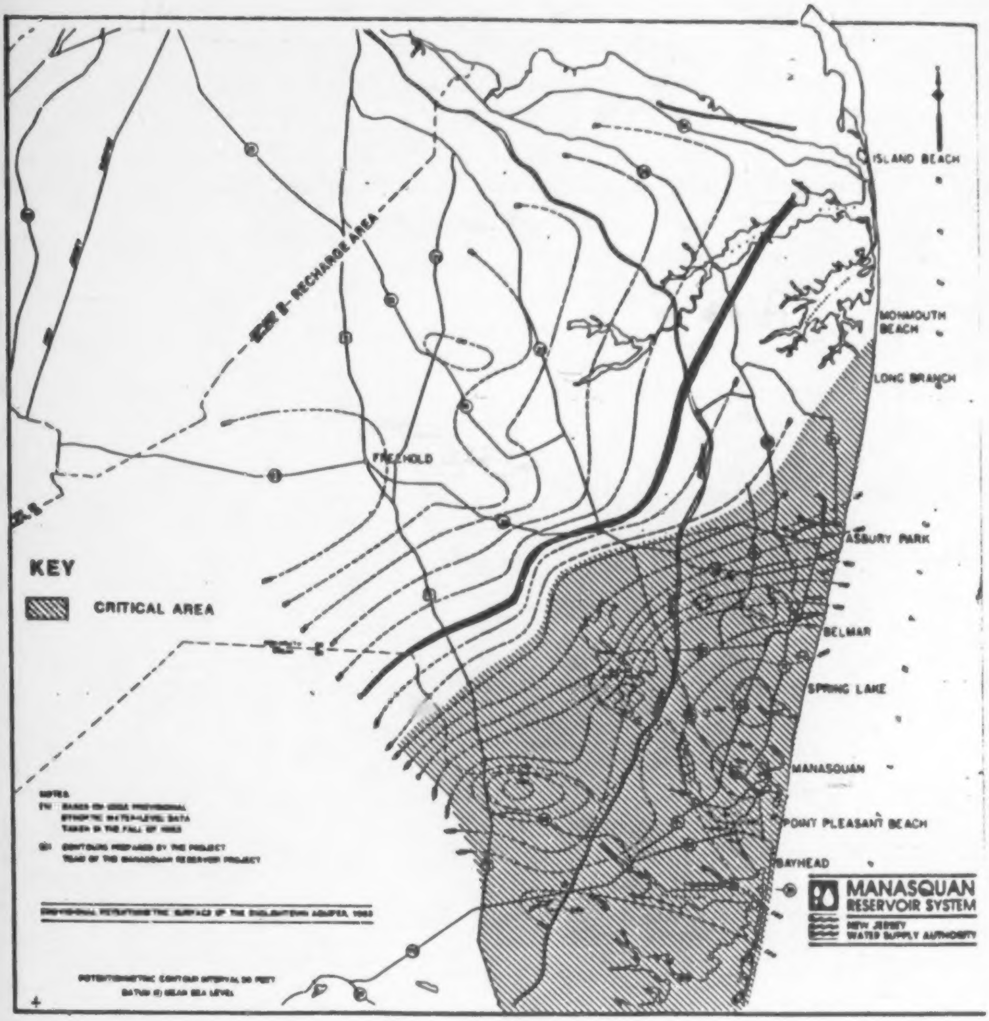
CJG AM 6/19/84 2-G

The following map shows the information about the water levels in the Englishtown aquifer that was collected in 1983. This new information shows that the heavy use of this aquifer is continuing to effect the water levels in the aquifers.

One change is that the single cone of depression near Point Pleasant has now become two cones close together and now cover a greater area. The point of the cone is somewhat deeper.

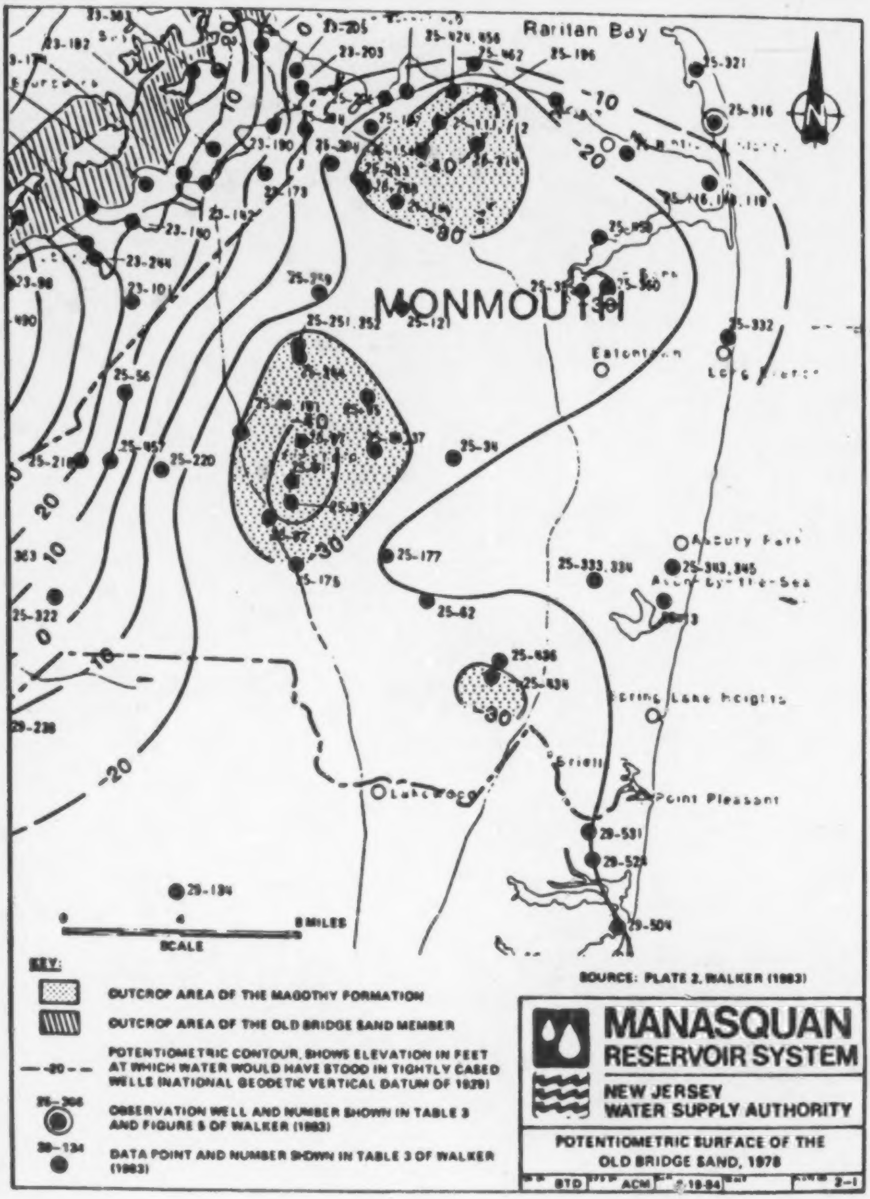
Another change is that the ring that represents aquifer water levels that are at sea level has changed. It now runs north of Eatontown and is also further inland. In the Raritan Bay area this line has moved closer to the recharge area and it no longer runs out under Raritan Bay.

The line that represents water levels of 100 feet below sea level is now slightly north of Asbury Park and is somewhat farther inland.


ISLAND BEACH
ZONE 2 - RECHARGE AREA
MONMOUTH BEACH
LONG BRANCH
FREEHOLD
ASBURY PARK
KEY
CRITICAL AREA
BELMAR
SPRING LAKE
MANASQUAN
POINT PLEASANT BEACH
BAYHEAD
NOTES
(1) BASED ON USGS PROVISIONAL SYNOPTIC WATER-LEVEL DATA TAKEN IN THE FALL OF
(2) CONTOURS PREPARED BY THE PROJECT TEAM OF THE MANASQUAN RESERVOIR PROJECT
PROVISIONAL POTENTIOMETRIC SURFACE OF THE ENGLISHTOWN AQUIFER
MANASQUAN RESERVOIR SYSTEM
NEW JERSEY WATER SUPPLY AUTHORITY
POTENTIOMETRIC CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

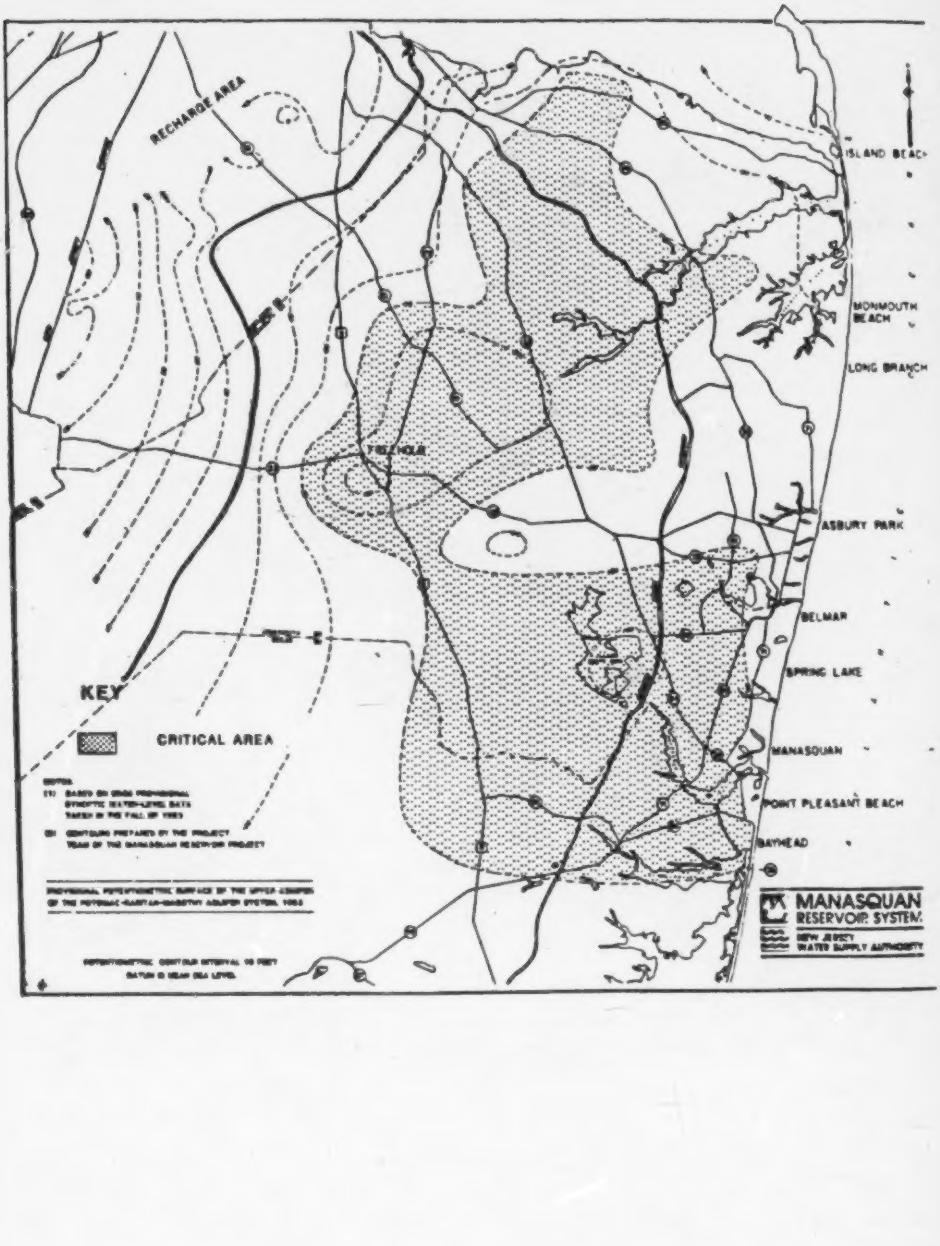
The following two maps show the water levels in a part of the Magothy Raritan aquifer. The first map is showing information collected in 1978, the second information collected in 1983.

The second map shows that the cones of depression are getting deeper and larger in response to the continued withdrawal of water from this aquifer.


Raritan Bay
MONMOUTH
Eatontown
Long Branch
Asbury Park
Ocean Grove
Avon-by-the-Sea
Spring Lake Heights
Brielle
Point Pleasant
Lakewood
N
-10
-20
-30
-40
0
10
20
-20
25-321
25-316
25-332
25-424, 456
25-462
25-186
25-121
25-251, 252
25-34
25-177
25-62
25-175
25-333, 334
25-343, 345
25-436
25-434
25-220
25-457
25-218
25-56
25-322
23-101
23-244
23-180
23-173
23-190
23-203
23-205
23-182
23-98
29-238
29-531
29-528
29-504
29-134
0
4
8 MILES
SCALE
KEY:
▨ OUTCROP AREA OF THE MAGOTHY FORMATION
▥ OUTCROP AREA OF THE OLD BRIDGE SAND MEMBER
—-20—— POTENTIOMETRIC CONTOUR, SHOWS ELEVATION IN FEET AT WHICH WATER WOULD HAVE STOOD IN TIGHTLY CASED WELLS (NATIONAL GEODETIC VERTICAL DATUM OF 1929)
25–306 ◎ OBSERVATION WELL AND NUMBER SHOWN IN TABLE 3 AND FIGURE 5 OF WALKER (1983)
29–134 ● DATA POINT AND NUMBER SHOWN IN TABLE 3 OF WALKER (1983)
MANASQUAN
RESERVOIR SYSTEM
NEW JERSEY
WATER SUPPLY AUTHORITY
BTD
ACM
2-19-84
2-1

SOURCE: PLATE 2, WALKER (1983)

POTENTIOMETRIC SURFACE OF THE OLD BRIDGE SAND, 1978


RECHARGE AREA
FREEHOLD
ISLAND BEACH
MONMOUTH BEACH
LONG BRANCH
ASBURY PARK
BELMAR
SPRING LAKE
MANASQUAN
POINT PLEASANT BEACH
BAYHEAD
KEY
CRITICAL AREA
NOTES:
(1) BASED ON USGS PROVISIONAL SYNOPTIC WATER-LEVEL DATA TAKEN IN THE FALL OF 1983
(2) CONTOURS PREPARED BY THE PROJECT TEAM OF THE MANASQUAN RESERVOIR PROJECT
PROVISIONAL POTENTIOMETRIC SURFACE OF THE UPPER AQUIFER OF THE POTOMAC-RARITAN-MAGOTHY AQUIFER SYSTEM, 1983
POTENTIOMETRIC CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL
MANASQUAN RESERVOIR SYSTEM
NEW JERSEY WATER SUPPLY AUTHORITY

Senator **Bradley**. Ms. Haskin, if you could stop there, I've read the rest of your statement, and I'll ask some questions later. I think you have a number of very good points, and I want to follow up at that time.

I'd like to have the rest of the panel make their statements now, if that's OK.

Let's have Ms. Mary Ellen Noble of the Watershed Association.

## STATEMENT OF MARY ELLEN NOBLE, WATERSHED ASSOCIATION OF THE DELAWARE RIVER

Ms. **Noble**. Thank you, Senator.

Senator **Bradley**. Welcome.

Ms. **Noble**. I'll cut back a little bit on what I have here. It is before you. We appreciate this opportunity to be heard.

I wanted to talk today about two difficult topics: water use efficiency and aquifer protection. Virtually everyone agrees in principle with efficiency and protection. Such programs seem administratively and institutionally complicated, especially when compared with dams.

It has been easy for the public and their elected representatives to understand a reservoir project requiring *x* dollars for *x* billion gallons, to be completed in *x* years. It has been less easy to explain problems which increase water supply by reducing water demand and by protecting the aquifer and watershed systems which give us our rivers, estuaries, and bays.

But costs are expanding for megaprojects such as the Tocks Island Dam and for even relatively small reservoir expansions such as the F.E. Walter and Prompton Dams in the upper Delaware watershed. The costs of capital, of construction, and the environmental costs of impoundments are rising. With the additional pressures for local funding of water projects, it is increasingly apparent that water use efficiencies and resource protection can, in most instances, provide the least cost alternatives to major impoundments and interbasin and interwatershed transfers.

Public understanding and awareness of natural and manmade water systems have been raised to new high levels by repeated revelations of contaminated water and by the recent series of drought warnings. We think that this awareness can support nonstructural and protective approaches which will help to bring more localities into balance with the hydrologic cycles.

Water use efficiencies have already been acknowledged through dollars aimed at infrastructure rehabilitation—cutting waste through leak detection and distribution system repair—and I certainly know what Ms. Haskin had to say about funding for such projects. And many industries, in response to the high cost of energy and waste treatment, have reduced water use to save money, but not nearly enough has been done.

Our regional population is not so much expanding its total as it is shifting its location. As megalopolis spreads into previously rural areas, it often overbalances the local hydrologic cycle. Take, for example, a 900-unit housing development set down in farmland. It pumps ground water through each unit, collects and moves the wastewater away to treat it, adequately or not so adequately, and discharges it into a stream which may or may not be able to handle the nutrient load.

Properly permitted, this ground water withdrawal may not result in a progressive lowering of the water table, but all too often as developing areas become sensitive to lack of rainfall, the ground water is exported as waste while recharge is reduced by roofs, pavement and rapid stormwater runoff, and the aquifer has lost the needed reserve to deal with dry times. The costs of this kind of use are high—high in treatment costs to protect the receiving streams, and high in the loss of quantity and quality of stream flow, especially in dry weather.

Rather than incurring another high cost by reaching out to a distant impoundment for supplemental water, the local first step in dealing with this and similar problems is to reduce the total per capita use of water. Our traditional plumbing appliances are water hogs. But water-efficient plumbing and appliances are now both compatible and cost-competitive and do not restrict cleanliness or lifestyle. As one example, we append information on a new American manufactured 1-gallon flush toilet.

For existing urbanized areas served by surface water reservoirs, cutting water use through system rehabilitation, metering and plumbing retrofit can compare favorably to the costs of expanding reservoir systems. Certainly in the Delaware River Basin, we are faced with the mega-example of this conflict in the case of New York City. The drought of the 1960's showed that the city's Delaware basin reservoirs are not able, when rainfall is low, to provide both the amounts of water allocated to the city, as well as the amounts the Supreme Court guaranteed to the river downstream. This has resulted in a series of negotiations between the city and the States to operate the reservoirs to close tolerances in order to stretch the reserve as far as possible.

But New York City's inability to reduce its long-term per capita water consumption or to turn to the Hudson River continues to rankle in the Delaware basin. Faced with the prospect of new DRBC surface water fees and perhaps fees for groundwater use, in order to finance new reservoir storage, some water users in the Basin are asking that their acquiescence to these charges be matched by a requirement to or a commitment from New York City to reduce its demand.

Reducing the flow of water through human systems not only protects the resource, but also reduces the cost of collecting, moving and treating water. And wastewater treatment is another area of high cost and continuing pollution where efficiencies can save money. The Federal Government spends billions of dollars to protect our waterways from the nutrients in human waste. Applied to the land instead of to streams, however, these nutrients can pay back in dollars gained rather than dollars lost.

The natural abilities of living soil and plant systems to convert and utilize a wastwater stream are highly efficient and can yield dollars rather than swallowing them.

One project in the Delaware basin now at the construction bid stage will yield back clean water to the locality, along with ethanol, electricity and cattle feed. It is projected to pay for itself within 8 to 10 years, and thereafter yield a profit for the city of

Vineland, NJ. Whoever heard of a sewage treatment plant making money? And if this is such a good idea, why aren't they everywhere? The problems are chiefly institutional, including the need to have Federal wastewater treatment grants require a true evaluation of such alternatives before approving conventional stream discharge systems.

There's also a vested interest on the part of many consulting and constructing engineering firms to continue with the systems which they have been geared to provide. Circular systems of wastewater land treatment are important to water supply, in that they can return clean water to aquifers, to streams or to local use. Used together with demand management strategy and land use policies which maximize groundwater recharge, they can go a long way toward preventing more and more localities from reaching outside of their watersheds to distant sources of potable water.

This is the approach which WADR took when we commented to the DRBC on the proposal to alter the compact in order to finance reservoir storage. That statement is appended.

In view of the time, I would like to—should I read the rest of that? I just one want to pick up one piece.

Senator Bradley. Pick up the one piece.

Ms. Noble. Which is, streams and rivers can accurately be described as "exposed aquifers" and it is a DRBC truism to acknowledge the interconnection of ground and surface waters. Since the dry weather baseflows of the Delaware are the focus of concern in every drought, it is simply good common sense to do all we can to enhance and assist the natural ability of our aquifers to supply baseflow efficiently. We believe this effort to be more rational than requiring ever-additional fees and users to build reservoirs to supply inefficient water use or to supply areas which would reduce our aquifers.

Thank you.

[The prepared statement of Ms. Noble follows:]

***WATERSHED ASSOCIATION***
***of the***
***DELAWARE RIVER***

**P. O. Box 4**
**Frenchtown, N. J. 08825**

Statement before the
SUBCOMMITTEE ON WATER AND POWER
of the
Energy and Natural Resources Committee
UNITED STATES SENATE

August 7, 1985
Cherry Hill, New Jersey

The Watershed Association of the Delaware River appreciates this opportunity to be heard concerning water resources in the Metropolitan Area, especially as they relate to the Delaware and its watershed.

WADR is a young organization seeking to provide a source of information and a channel of expression for citizens and citizen groups in the four states of the Delaware watershed who are concerned with both local and regional water issues. We are, up to this point, entirely volunteer and have initially focused on monitoring and reporting on the progress of projects and agencies. We attend each Delaware River Basin Commission meeting and are well aware of the complexities--organizational, institutional and fiscal--which stand in the way of managing water according to hydrologic units which extend across state and municipal boundaries. We attach (App. A) WADR's "Managment Philosophy" for the Delaware Watershed, a brief list of policy statements under the heading "Design with Nature."

I want to talk today about two difficult topics--water use efficiency and aquifer protection. While virtually everyone agrees in principle with efficiency and protection, such programs seem administratively and institutionally complicated, especially when compared to dams. It has been easy for the public and for their elected representatives to understand a reservoir project requiring X dollars for X billion gallons, to be completed in X years. It has been less easy to fund and to explain programs which increase water supply by reducing water demand and by protecting the aquifer and watershed systems which give us rivers, estuaries and bays.

But costs are expanding for mega-projects--such as the Tocks Island Dam--and for even relatively small reservoir expansions, such as the F.E. Walter and Prompton Dams in the upper Delaware watershed. The costs of capital, of construction, and the environmental costs of impoundments are rising. With the addition of pressures for local funding of water projects, it is increasingly apparent that water use efficiencies and resource protection can, in most instances, provide the least-cost alternatives to major impoundments and inter-basin and inter-watershed transfers.

Public understanding and awareness of natural and man-made water systems have been raised to new high levels by repeated revelations of contaminated water and by the recent series of drought warnings. We think that this awareness can support non-structural and protective approaches which will help to bring more localities into balance with the hydrologic cycle.

Water use efficiencies have already been acknowledged through dollars aimed at infrastructure rehabilitation--cutting waste through leak detection and distribution system repaid--and many industries, in response to the high cost of energy and waste treatment, have reduced water use to save money. But not nearly enough has been done.

Our regional population is not so much expanding its total as it is shifting its location. As Megalopolis spreads into previously rural areas it often overbalances the local hydrologic cycle. Take for example a 900 unit housing development set down in farmland. It pumps ground water through each unit, collects and moves the wastewater away to treat it--adequately or not so adequately--and discharges it to a stream which may or may not be able to handle the nutrient load. Properly permitted, this ground water withdrawal may not result in a progressive lowering of the water table. But all too often these developing areas become sensitive to lack of rainfall. The ground water is exported as waste while recharge is reduced by roofs, pavement and rapid storm water runoff, and the aquifer has lost the needed reserve to deal with dry times. The costs of this kind of use are high--high in treatment costs to protect the receiving streams, and high in the loss of quantity and quality of stream flow, especially in dry weather.

Rather than incurring another high cost by reaching out to a distant impoundment for supplemental water, the logical first step in dealing with this and similar problems is to reduce the total per capita use of water. Our traditional plumbing and appliances are water hogs. But water-efficient plumbing and appliances are now both compatible and cost-competitive and do not restrict cleanliness or lifestyle. As one example we append (App. B) information on a new American-manufactured one-gallon flush toilet.

For existing urbanized areas served by surface water reservoirs cutting water use through system rehabilitation, metering and plumbing retrofit can compare favorably with the costs of expanding reservoir systems. Certainly, in the Delaware River Basin we are faced with the mega-example of this conflict in the case of New York City. The drought of the 60's showed that the City's Delaware Basin reservoirs are not able, when rainfall is low, to provide both the amounts of water allocated to the City as well as the amounts the Supreme Court guaranteed to the river downstream. This has resulted in a series of negotiations between the City and the States to operate the reservoirs to close tolerances in order to stretch the reserve as far as possible.

But New York City's inability to reduce its long-term per capita water consumption or to turn to the Hudson River continues to rankle in the Delaware Basin. Faced with the prospect of new DRBC surface water fees--and perhaps fees for ground water use--in order to finance new reservoir storage, some water users in the Basin are asking that their acquiescence to these charges be matched by a requirement to, or a commitment from New York City to reduce its demand.

Reducing the flow of water through human systems not only protects the resource but also reduces the cost of collecting, moving and treating water. And wastewater treatment is another area of high cost and continuing pollution where efficiencies can save money. The federal government spends billions of dollars to protect our waterways from the nutrients in human waste. Applied to the land instead of to streams, however, these nutrients can pay back in dollars gained rather than lost. The natural abilities of living soil and plant systems to convert and utilize a wastewater stream are highly efficient and can yield dollars rather than swallowing them.

One project in the Delaware Basin now at the construction bid stage will yield back clean water to the locality, along with ethanol, electricity and cattle feed. It is projected to pay for itself within 8 to 10 years and thereafter yield a profit for the City of Vineland, N.J. Who ever heard of a sewage treatment plant making money? And if this is such a good idea why aren't they everywhere? The problems are chiefly institutional, including the need to have federal wastewater treatment grants require a true evaluation of such alternatives before approving conventional stream discharge systems. There is also a vested interest on the part of many consulting and constructing engineering firms to continue with the systems which they have been geared to provide.

Circular systems of wastewater land treatment are important to water supply in that they can return clean water to aquifers, to streams or to local use. Used together with demand management strategies and land use policies which maximize ground water recharge they can go a long way toward preventing more and more localities from reaching outside of their watersheds to distant sources of potable water.

This is the approach which WADR took when we commented to the DRBC on its proposal to ask Congress to alter the Delaware River Basin Compact in order to finance new reservoir storage. (App. C) There we said, in part:

"We believe that, in most if not all circumstances, the least-cost alternative for water supply lies in water use efficiency. Therefore we advocate that user fee revenues, if realized, should first be applied to such least-cost alternatives. These should include: a) active efforts to gather and evaluate technologies that reduce water demand, especially for non-domestic water users; b) agressive promotion of these technologies to appropriate basin water users; c) establishment of a DRBC revolving loan fund which would assist users to implement water saving technologies through low-interest or no-interest loans; and d) purchase of leak-detection equipment which can be shared by many users, perhaps on a short-term lease basis.

"Funds can also be used to develop and implement policy which agressively advocates: a) water efficient plumbing codes; b) adquifer protection and enhancement through preservation of open recharge areas and freshwater wetlands; and c) land treatment of wastewater and discouragement of regional sewage collection systems which involve long distance transport of ground water."

"Streams and rivers can accurately be described as "exposed aquifers," and it is a DRBC truism to acknowledge the interconnection of ground and surface waters. Since the dry weather baseflows of the Delaware are the focus of concern in every drought it is simply good common sense to do all we can to enhance and assist the natural ability of our aquifers to supply baseflow efficiently. We believe this effort to be more rational than requiring ever additional fees and users to build reservoirs to supply inefficient water use or to supply areas which abuse their aquifers."

"The Francis E. Walter and Prompton Reservoir projects have been advocated and then authorized through the Level B Study, the Interstate Water Management Recommendations, and by direct action of the Commissioners. These actions in large part resulted from the deferment of the Tocks Island project, and we have been told that the Walter and Prompton projects are necessary alternatives to Tocks Island. We therefore suggest that any Congressional action to amend the Compact for financing purposes be coupled with Congressional action to deauthorize the Tocks Island project."

Appendix A

**WATERSHED ASSOCIATION**
**of the**
**DELAWARE RIVER**

P. O. Box 4
Frenchtown, N. J. 08825

## A MANAGEMENT PHILOSOPHY FOR THE DELAWARE RIVER WATERSHED

"Design with Nature" is the core of our management philosophy for the Delaware River Watershed.

That means: Managing the Watershed as an integrated hydrologic unit with respect for natural systems;

Using the lands and waters of the Watershed within their carrying capacities;

Solving the resource management problems of the Watershed with non-structural solutions wherever possible;

Protecting the integrity of the Delaware as a free-flowing river;

Minimizing activities that pollute, deplete or degrade the water resources;

Permitting no further transfers of water out of the Watershed;

Using and returning water as close as possible to its source.

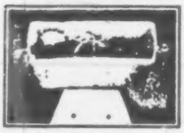
Our management philosophy for the Delaware River Watershed also incorporates:

Public participation in decision-making at all stages;

Protection of the integrity of traditional communities along the River and its tributaries.

# Exclusive advantages

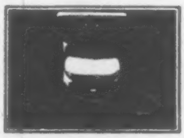
## Conventional Tank Trim



**...no special, hard-to-adjust parts inside.**

There is a pleasant surprise when you lift the tank lid on Eljer's Ultra-One/G. The only visual difference from a conventional tank is a small, permanently installed reservoir which meters the one-gallon of water from the tank to the bowl during the flush and maintains a high static head of water. The ballcock and the Douglas-type flush valve, which are factory assembled in the tank, are of conventional design.

## Styling preferred by architects and consumers



**...contemporary look fits all bath decors.**

Eljer recently conducted focus-group interviews with architects and mall-intercept studies with consumers to evaluate their reaction to Eljer's styling approach for its water saving toilets.

Of the architects interviewed, 90% preferred the Eljer styling. Consumers preferred Eljer's styling 3 to 1 over that of the next closest major manufacturer.

## Conventional Installation

**...installs faster than most toilets.**

The Ultra-One/G installs in the conventional manner to conventional plumbing systems.

All tank trim components are factory-installed. The two brass tank-to-bowl bolts are held in place by a special retainer. The tank-to-bowl gasket is affixed in place so the installer simply removes the tank from its carton, and positions it onto the bowl. He completes the assembly by tightening two brass nuts.

In recent timed installation trials conducted by Eljer, complete installation of comparable Eljer units, from unpacking product to check of water level in the tank, was accomplished in an average of 10.5 minutes as compared with averages of 15 minutes/55 seconds and 17 minutes/32 seconds for installations of units manufactured by Eljer's competition.

## "Off-the-Shelf" availability

**...eliminates job delays.**

The Ultra-One/G is an inventory item at Eljer wholesale distributors. There's no waiting for a special order shipment.

And, the Ultra-One/G Toilet is available in all Eljer fashion colors, too.

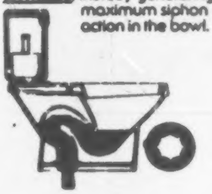
# An inside view of what makes Eljer's Ultra-One/G toilet such a great performer

Until now, most 1-gallon flush toilets required elaborate systems or expensive compressed air mechanisms to move waste water into sewer lines.

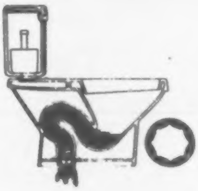
Not so with the Eljer Ultra-One/G. It's a simple two-piece (tank and bowl) water closet that works efficiently in residential and commercial applications, flushing on only one gallon of water, without any additional systems. Result: you get water-savings and efficient waste removal at the lowest cost.

## Patented orifice produces same flushing efficiency as a conventional toilet

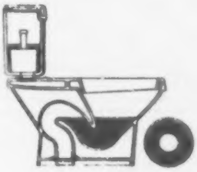
1. When toilet is flushed, the soft, flexible orifice at the bowl outlet, slows release of water and waste momentarily discharging it en masse, thereby generating the maximum siphon action in the bowl.



2. The accumulated water causes the orifice to open discharging the mass of waste and water through the outlet.



3. The orifice closes after discharge, as the trap and tank refill with water.



Appendix B - page 2

# The Eljer Ultra-One/G Toilet Meets or Exceeds ANSI Waste Removal Standards

The Eljer Ultra-One/G toilet was subjected to a series of tests at Stevens Institute of Technology, Davidson Laboratory, Hoboken, New Jersey.

The testing methods used were those established by the American National Standards Institute (ANSI) to determine and evaluate the ability of a water closet to remove various kinds of wastes, and to measure its water usage in relation to accepted standards for "watersaver" classifications.

In all tests, the Eljer Ultra-One/G Toilet met or exceeded ANSI standards.

Extensive testing of Ultra-One/G toilet included waste transport performance.

ULTRA-ONE/G TOILET—SUMMARY OF PERFORMANCE

| [illegible] | Ball Test [illegible] | Granule Test ANSI 7.4.2.2 | Cylinder Test ANSI 7.4.2.3 | Ink Test ANSI 7.4.4.1 | Dye Test ANSI 7.4.5.1 | Flush Volume ANSI 7.4.6.1 |
|---|---|---|---|---|---|---|
| Test Method | Flush 100 Balls Per Flush | Flush 2,500 Granules Per Flush | Flush 4 Cylinders Per Flush | Cleanse Ink Line | Flush Dye Through Toilet | Flush Toilet Measuring Volume Used |
| [illegible] | [illegible] | No More Than 125 Granules Remaining Per Flush. Reg Flushes | Flush At Least Two Per Flush. Total 15 out of 20 in Five Flushes | No Line Increment Greater than ½". Total all Increments Not To Exceed 2". Three Flushes | Dilution Ratio of Water to Dye Must Be At Least 100:1. Three Flushes | Volume Used Not to Exceed 3.5 Gallons Per Flush. Average of Three Flushes |
| Ultra-One/G Performance | Flushed an Average of 97 Balls | 14 Granules Remaining | Flushed 17 Cylinders | Line Completely Cleansed | Dilution Ratio of 183:1 | Volume Used— 1.0 Gallon |
| [illegible]-One/G Performed [illegible] Standards [illegible] | [illegible] | 89% | 13% | 100% | 83% | 71.4% |

**ELJER**

911-3010-00 Litho U.S.A. 385100A

Eljer Plumbingware
Three Gateway Center
Pittsburgh, Pennsylvania 15222

A HOUSEHOLD INTERNATIONAL COMPANY

DECEMBER 1, [illegible]

Contractor Magazine

© TECHNICAL PUBLISHING

TWICE MONTHLY Essential News of Mechanical Contracting AIR CONDITIONING • HEATING • PLUMBING

# Eljer unveils 1-gal toilet; prices drop

*Special to* CONTRACTOR

ATLANTA — Eljer Plumbingware has announced what it calls "a major breakthrough" in water conservation toilets with its *Ultra-One/G*, "the first one-gallon flush toilet ever produced by a major American plumbingware manufacturer."

In unveiling the unit at the recent Plumbing-Heating-Cooling-Piping Exposition here, Eljer officials said the model will sell for approximately half the price of competing 1-gal flush water closets and not much higher than that of conventional toilets.

### Rival models also exhibited

There were at least two other makes of one-gallon toilets on display at the trade show: Colton-Wartsila's Ifö *Cascade* and Thetford Corp.'s *Superinse*. Both are made in the U.S., but neither producer is ranked as a "major" manufacturer here.

Colton-Wartsila, part of Sweden's Wärtsilä Group, is based in Colton, Calif. Thetford is headquartered in Ann Arbor, Mich.

Actually, Thetford's Superinse is the only "all American" model of the three, having American styling and an American-designed flushing system. The Eljer Ultra-One/G also has American styling but its flushing system is of Swedish design — Eljer holds an exclusive license to use it in the U.S. The Ifö Cascade is Swedish-designed inside and out.

### Price competition starts

More significantly, Eljer's price-busting entry into the ultra-low flow toilet market has already prompted a competitive reaction from Colton-Wartsila in the form of a new low price for its Ifö Cascade.

**Eljer personnel said they expect their Ultra-One/G to retail at approximately $160 to $200, depending on round or elongated bowl and excluding the seat. The Ifö Cascade, in white and also exclusive of seat, had been retailing at $330, but a Colton-Wartsila spokesman told a CONTRACTOR reporter that the price was now being dropped to "about $200" in order to "meet the competition."**

The Superinse retails at roughly $400, with the seat included. A Thetford spokesperson said there were no immediate plans by that manufacturer to change the price of its Superinse.

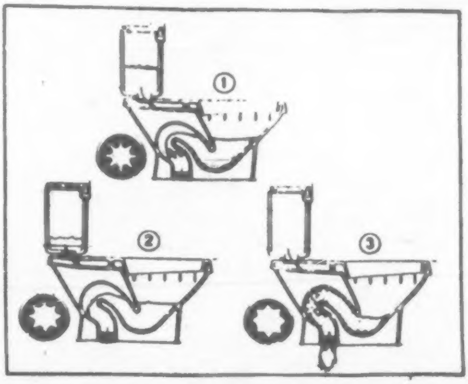
The Eljer Ultra-One/G, like the Ifö Cascade and the Superinse, is recommended for installation in residential and commercial buildings where reduced water consumption and/or sewage loads are desired or necessary.

The competing models are also similar in that all are of continuous slotted-rim design and rely strictly on combinations of atmospheric pressure and gravity for their flushing action; no compressed air is involved.

**Eljer personnel are particularly keen on what they claim is the Ultra-One/G's superior waste-transport performance, which relates to flushing efficiency** (*see illustration*).

The Ultra-One/G is as quick and easy to install as any conventional residential two-piece toilet, Eljer officials said.

It is expected to be in Eljer wholesalers' inventories by mid-February.



Patented diaphragm of Ultra-One/G one-gallon toilet looks like a food-waste disposer flap when viewed from overhead. Located at toilet outlet, its action separates the flushing sequence into three phases. When toilet is flushed (1), a momentary delaying action retains flushed water in the bowl and trapway (2). Secondary ventilation occurs as diaphragm opens completely, allowing accumulated "mass" of water to rush through outlet (3) with enough velocity to transport waste matter away.

Appendix C

**WATERSHED ASSOCIATION**
**of the**
**DELAWARE RIVER**

**P. O. Box 4**
**Frenchtown, N. J. 08825**

Port Jervis, N. Y.

May 29, 1985

The Watershed Association of the Delaware River, WADR, is a non-profit, tax-exempt organization committed to a clean, healthy, free-flowing Delaware River. Thank you for the opportunity to submit our comments regarding the financing of water projects.

Section 1.2(g) of the DRBC Compact, the definition of "project," clearly includes non-structural solutions to water management problems. We believe that, in most if not all circumstances, the least-cost alternative for water supply lies in water use efficiency. Therefore, we advocate that user fee revenues, if realized, should first be applied to such least-cost alternatives. These should include: a) active efforts to gather and evaluate technologies that reduce water demand, especially for non-domestic water users; b) aggressive promotion of these technologies to appropriate basin water users; c) establishment of a DRBC revolving loan fund which would assist users to implement water saving technologies through low-interest or no-interest loans; and d) purchase of leak detection equipment which can be shared by many users, perhaps on a short-term lease basis.

Funds can also be used to develop and implement policy which aggressively advocates: a) water efficient plumbing codes; b) aquifer protection and enhancement through preservation of open recharge areas and freshwater wetlands; and c) land treatment of wastewater and discouragement of regional sewage collection systems which involve long distance transport of ground water.

Streams and rivers can accurately be described as "exposed aquifers", and it is a DRBC truism to acknowledge the interconnection of ground and surface waters. Since the dry weather baseflows of the Delaware are the focus of concern in every drought it is simply good common sense to do all we can to enhance and assist the natural ability of our aquifers to supply baseflow efficiently. We believe this effort to be more rational than requiring ever additional fees and users to build reservoirs to supply inefficient water use and to supply areas which abuse their aquifers.

The background paper on financing arrangements lists three considerations for modification of section 15.1(b) of the Compact: securing project bonds; equity between users; and encouraging economic investment. Obtaining the lowest possible interest rates for DRBC bonds is a valid purpose in the public interest.

If a broader user base will facilitate the lowering of interest rates, then such action should be supported. Equity between users, as a concept, is as desireable as motherhood and hot apple pie. Motherhood and apple pie are easier to come by than equity, but we do support the concept of fair and equitable user fees. Encouraging economic investment is a somewhat more difficult concept to embrace. Certainly we want sufficient water to serve industry and the jobs it provides, but as outlined above we believe that dollars spent on water use efficiency and on insuring healthy aquifers which support good baseflows represent the least-cost first alternative.

One purpose for the use of water charges is conspicuously missing from the background paper, and that is user fees as a tool for demand managment. WADR believes that the dollar could be an effective tool for water management. A DRBC user fee rate structure should motivate the efficient use of water through economic incentive.

The Francis E. Walter and Prompton Reservoir projects have been advocated and then authorized through the Level B Study, the Interstate Water Management Recommendations, and by direct action of the Commissioners. These actions in large part resulted from the deferrment of the Tocks Island project, and we have been told that the Walter and Prumpton projects are necessary alternatives to Tocks Island. We therefore suggest that any Congressional action to amend the Compact for financing purposes be coupled with Congressional action to deauthorize the Tocks Island project.

WADR would support the modification of section 15.1(b) of the DRBC Compact if such modification will result in an equitable system of water user fees throughout the entire basin and its service areas, and if a substantial portion of those revenues are earmarked for water use efficiency strategies and enhancement and protection of aquifers, and if the required federal legislation includes the deauthorization of the Tocks Island Dam.

Recognizing that section 3.7 of the Compact may limit the authority of the Commission to impose charges for purposes other than for the use of tangible facilities, we would also support amendment of the Compact to permit charges for non-structural solutions such as those mentioned at the beginning of our comment. We believe it is time for all the signatory parties to extend their acknowledgement of the pooled waters concept beyond the process of allocation and payment into the active preservation and conservation of the resource, allowing the management of the Delaware River Basin as a Watershed without the institutional restrictions imposed by four separate political entitites.

Senator **Bradley**. Ms. Noble, thank you very much for your testimony. It was very interesting.

Mr. Simpkins, please proceed.

## STATEMENT OF ROBERT N. SIMPKINS, LEGISLATIVE CHAIRMAN, STATE GRANGE OF NEW JERSEY

Mr. **Simpkins**. Greetings. I am pleased to have an opportunity to share in behalf of the New Jersey State Grange and I do have, shared with the New Jersey Farm Bureau, and what I say is jointly in the opinion of the New Jersey Farm Bureaus, the New Jersey State Grange, and the Department of Agriculture.

We had to start at a point somewhere, and it is interesting.

The drought that befell New Jersey in 1980 took water planners by surprise, demonstrating the inadequacy of existing facilities and rejuvenating interest in expanding and updating New Jersey's water supply, storage and transfer capabilities. The Tocks Island plan was again being discussed as perhaps the only project whose scope was such that it could reliably meet the needs of the State.

Then the "great planners" came up with a program of smaller projects that would help—but where are they? Their capabilities will be exhausted before they are all built.

Take into account the tremendous expansion of water need since 1980 and consider the great increase for human use.

With the ever-increasing need for production agriculture the need will double in the next 10 years.

Hydroelectric generation is most important to the economy of our State and region. This is inexpensive, dependable, electric power. We need a feasibility study. The dam would probably pay for itself within 40 years.

All should see and understand how the Yards Creek Pumped Storage Electric Generating Station works and how it is adding significantly and substantially to New Jersey's electric power supply and adding immeasurably to surface reliability.

The plan for Canada to build two huge generating plants that would supply power to the Eastern part of the United States would take millions of dollars out of the country and lose thousands of jobs.

The Tocks Island Dam would provide the most efficient, effective means of augmenting the Delaware's flow in times of drought and preventing saline water in the Delaware Bay from traveling upstream to Camden, where ground water quality, due to induced infiltration, is largely dependent upon river water.

Tocks Island Dam would also be the most effective measure that could take the prospect itself from drastic to costly flooding.

The land needed is already in public ownership.

What is needed to move forward now is the support of the Congress of the United States, the Governors of all four States, and the Delaware River Basin Commission.

Water levels in the aquifer below Cranbury have fallen below 7 and 12 feet during the past 10 years. The target area in the State are in the Camden region, the region from northern Cape May County to extreme southern Ocean County, including Atlantic City, eastern Middlesex County, and the area from northern to eastern Monmouth County and northern Ocean County.

As the water table in the aquifer gets lower, it creates a vacuum which draws salt water from the ocean and pollutants from land into the earth.

People forget that farms are manufacturing complexes, too, and that it takes something like 4,500 gallon of water to grow food contained in one person's typical daily menu.

Agriculture, the largest single business in this country, must meet the need of the tremendous growth in the use of center pivots and line irrigation, and in farm ponds and private lakes.

Farmers must have equal representation in all water planning and management regulations.

It is self-evident that water for drinking and other daily human use must be—have top priority. Next must be the need of agriculture for drink and food cannot be separated.

The State Department of Agriculture and Secretary Arthur H. Brown, Jr., fully endorse the establishment of Tocks Island Dam at the earliest possible date. Likewise, the New Jersey Farm Bureau and the New Jersey State Grange.

We cannot wait long in the water business. The future is now.

It's a privilege to present this.

I have a statement from the New Jersey Farm Bureau, and I have authority to share that to answer questions as would be fitting.

Senator **Bradley**. Thank you very much, Mr. Simpkins. And the statement from the Farm Bureau, if you would provide it for us, will be included in the record.

[The prepared statement of Mr. Furey, New Jersey Farm Bureau follows:]

NEW JERSEY FARM BUREAU
GARDEN STATE
168 West State St., Trenton, New Jersey, 08608 tel. (609) 393-7163

August 7, 1985

TO: SENATOR FRANK H. MURKOWSKI, CHAIRMAN
SUBCOMMITTEE ON WATER & POWER
U.S. SENATE COMMITTEE ON ENERGY & NATURAL RESOURCES

FR: PETER J. FUREY, SECRETARY/ADMINISTRATOR Peter F.

RE: WATER SUPPLY ISSUES OF THE MID-ATLANTIC REGION

The following comments will supplement the statement being presented today by Mr. Robert N. Simpkins, legislative chairman of the state Grange of New Jersey. New Jersey Farm Bureau devotes much time and interest in water supply issues affecting agriculture. We believe that the issue of water supply is fast becoming the priority issue for the future of agriculture in the state and region.

For your information, New Jersey as the Garden State produces agricultural commodities each year worth $500 million, a figure which has been on the rise despite some diminution in the amount of land devoted to agriculture. Of that $500 million more than 50 percent of it is derived from crops that are highly dependent upon a reliable source of water. We firmly believe that the region in the future must have a plentiful supply of fresh produce close to the enormous metropolitan population base. Consequently, the approximate 75,000 acres of farmland in New Jersey which presently has irrigation facilities in place must have a plentiful supply of water to sustain and help expand production of those crops in the future.

Our experience with state regulations in the past few years regarding water supply has been somewhat nerve-racking because of the present limits in the capacity of our water supply facilities. Consequently, in periods of reduced rainfall, the regulatory response has no choice but to place a ceiling or even a rationing plan for existing water users. We in agriculture fortunately have not experienced such cut-backs as yet, but it is easy to see the threat we face should the water facility situation not be improved.

Furthermore, the New Jersey Department of Environmental Protection has just announced and is beginning to implement a new regulatory mechanism known as the "critical area designation" for areas of acute stress on underground water resources. These rules are meant to impose both a reduction in existing water use and a comprehensive realignment in the way in which water users tap into groundwater to meet their needs. The first such designation has been put in place in Monmouth county, and future plans call for two additional designations in Camden county and also Atlantic county. These regulations have been necessitated by a simple matter of groundwater pumpage exceeding the amount of groundwater recharge. The frightening aspect of the consequences here is that some water users will be forced to purchase their water from adjacent water systems at residential water rates. Such a prospect for farmers is incomprehensible. We are working closely with the DEP to minimize the impact of these rules on farmers.

Furthermore, we are alarmed by the recent proposals of the Delaware River Basin Commission which call for potentially a fee schedule for all users to help finance some new projects, as well as a proposed 15 percent water use cut-back on farmers. Both of these proposals would impose serious financial problems for most farmers who irrigate their crops in the Delaware River Basin area of New Jersey. For this reason and others New Jersey Farm Bureau has long supported the Tocks Island Dam project.

In summary, New Jersey with its urban population needs to do more to insure an adequate water supply for its population and large commercial business base. Work is underway toward the implementation of the $350 million approved for water facilities by the New Jersey electorate in 1981, but those projects will simply put us at a break-even situation. With regard to federal funds, New Jersey certainly deserves its fair share of funding to support both agricultural and non-agricultural needs into the future. We believe agriculture in the United States is undergoing a tremendous transformation currently, the results of which will be increased specialization and regional self-sufficiency. That will mean that New Jersey and other mid-Atlantic states must have an adequate water supply for its farmers.

Thank you for your consideration of the comments presented above.

#

PJF/db
cc: Senator William Bradley
Senator Frank Lautenberg

Senator **Bradley**. Mr. Owen, please proceed.

## STATEMENT OF ROBERT I. OWEN, CONSERVATIONIST, WEST LONG BRANCH, NJ

Mr. **Owen**. Thank you very much. I will not have to abbreviate my written testimony because I was lazy to start with and it only takes about 3 minutes or so.

I would like to say first, however, that I would hope the subcommittee, will not focus too exclusively on the Delaware River Basin as such, because large parts of all the mid-Atlantic States are not part of the basin, and the problems of aquifers and ground water, as well as other surface waters are all interrelated.

But there is a Federal role in all of these things, too. Since retirement from Federal service, I've involved myself as a volunteer in the conservation and environmental issues, including those relating to water supply and use. Since its inception nearly 2 years ago, I have been working on the Manasquan River Reservoir project as a member of the New Jersey Water Supply Authority Citizen's Advisory Board for the project.

However, the following observations are made strictly on my own initiative as an interested citizen. I might insert here that everything I have to say is, I believe, consistent with the views of a dozen or more environmental and conservation groups with which I am associated and aware of.

I'm concerned about the persistence and prevalence of the mistaken concept that through the introduction of new dams, deeper wells, and longer, more complex interlocking transmission systems, vast quantities of naturally renewable water can really be provided to keep up with an exponentially increasing demand.

These essentially technological fixes will, it is claimed, mitigate the worst effects of periodic droughts if combined at those times with temporary restrictions on consumer use. I trust the subcommittee, looking beyond this inadequate concept, will come to realize that recurring water crises in the mid-Atlantic States and elsewhere owe much to (1) haphazard excessive development in watershed and aquifer recharge areas; (2) continued drawing from aquifers in excess of dependable yield; and (3) the unnecessarily inefficient distribution and use of water.

Increasingly, actual or potential contamination of surface and ground waters by toxic substances also has become a significant factor in the mid-Atlantic water supply equation.

I commend to the subcommittee:

(1) The State of New Jersey's statewide water supply master plan as a useful example of water supply planning;

(2) The recent evolution and concept of the Manasquan River Reservoir project from simply another source of supply to accommodate growing demand to at least, in part, a means of assisting the replenishment of dangerously overdrawn aquifers; and

(3) The New Jersey Department for Environmental Protection's new regulations establishing water supply critical areas within which withdrawals from overstressed aquifers will be subject to certain controls intended to reduce the rate of depletion and perhaps permit recharge overtime. Other States would be wise to emu-

late New Jersey in taking such actions which, however, are only first steps, not going nearly far enough.

Much more needs to be done, as, for example, in the protection of aquifer recharge areas and in recognizing the proper role of water conservation in all its many forms as the most readily available and least expensive source of additional so-called water. The image of conservation as doing without must be exchanged for that of typifying the most efficient and suitable use of this most valuable of all natural resources.

I feel it is imperative that the U.S. Congress and appropriate departments and agencies of the executive branch continue to support the States with suitable funding and technical assistance as appropriate in the interests of improving and implementing long-range water planning policy.

Also desirable is Federal encouragement of interstate water management cooperation such as that exemplified by the Delaware River Basin Commission. There would also seem to be a Federal role in assuring that in the sometimes intense competition among States for new business or industry or the retention of old business and industry, those States which follow wise and proper water management practices are not at a disadvantage compared to States less dedicated to good water management.

Thank you.

Senator **Bradley**. Thank you very much, Mr. Owen. And I'd like to thank the entire panel. I have just a few very brief questions.

First, to the league, to Ms. Haskin. You supported in your statement a modification of the 15.1(b) proposal in which precompact users would be charged for the cost of additional supply in the whole system. Is that the league's position?

Ms. **Haskin**. Yes, that's the league's position. And the league counsel testified, sent a statement to this effect to the Delaware Basin Commission.

Senator **Bradley**. Please state the reason you hold that position once more for the record.

Ms. **Haskin**. We believe that the user should pay the true cost of a resource. And we do not favor grandfather clauses exempting certain users.

And the precompact users will benefit by any additional flow augmentation in the basin. We believe that they should share with the recent users in paying for this.

Senator **Bradley**. Ms. Noble, this process of wastewater treatment replenishing the water supply is intriguing, to say the least. Are there studies that you have or you would recommend for the committee as to the viability of this project?

Ms. **Noble**. I will be glad to provide some good information to the committee. I'm glad that you're interested. If you go to Muskegon, MI you will see an entire large city and its industries operating on such a system, at a profit.

Senator **Bradley**. And I suppose Vineland would have their system as an example.

Ms. **Noble**. Yes; I'd be happy to send you some basic information about that system which is, as I say, now having a little problem in the bid stage.

Senator **Bradley**. It is under construction?

Ms. Noble. No; I believe it's been held up at the bid stage.

I've talked with the project consultant, and he felt that although he had sent out about 100 bid specifications, there was considerable interest, he had received back only two bids.

Senator Bradley. And you suggest that in order to promote this at the Federal level we should amend the law that awards wastewater treatment grants to require a feasibility study for this approach prior to the issuance of those grants?

Ms. Noble. Basically that. I can send you something which outlines it in more detail.

Senator Bradley. OK, thank you very much.

Now, I'd like to ask Mr. Owen, you expressed real concern about ground water and about the threat to ground water. We have heard in these hearings that if you can combine a system that uses surface water and ground water so that you improve the overall efficiency of the system, you can get much longer use out of the available ground water.

Do you support that kind of conjunction?

Mr. Owen. Very much. I think this essentially is what underlies the State of New Jersey's critical areas designation to have a conjunctive use of both surface water and ground water and try to balance the need in such a way where you're not depleting one or the other source too rapidly, so they complement each other in effect.

Senator Bradley. Mr. Simpkins, do most of the agricultural users of water in New Jersey, to your knowledge, get that water from ground water sources or from surface water sources?

Mr. Simpkins. The large part would be from surface water. There are small percentages of deep wells using ground water, but the most would be tapped into a farm pond or a stream.

Senator Bradley. Would that be the case in Salem and Cumberland Counties, as well as in Warren County? Or does it differ depending on region?

Mr. Simpkins. Depending on the type of irrigation, I would say it would be my estimate that probably south Jersey uses more ground water than they do surface water.

Senator Bradley. Would you be opposed to, under very guarded circumstances, if it proved cost-effective, using water from the Pinelands elsewhere in New Jersey?

Mr. Simpkins. My acquaintance with that is to the study that was conducted mostly by the cranberry industry, that they felt that they needed all of that water for south Jersey and the cranberry-blueberry industry, the vegetable production, and that in that area it was needed there.

Senator Bradley. OK. Thank you very much, Mr. Simpkins, and I'd like to thank the panel for the testimony. I have found it very informative and very helpful.

Our last panel will be Mr. William Cobb, system company president of the American Water Works of Haddon Heights, NJ; and Mr. Fred Coldren, city manager, city of Cape May.

Gentlemen, welcome to the hearing. We'll try to limit testimony to 7 to 8 minutes, and then questions. Let's begin with Mr. Cobb.

## STATEMENT OF WILLIAM R. COBB, SYSTEM COMPANY PRESIDENT, AMERICAN WATER WORKS SERVICE CO.

Mr. COBB. Good morning. My name is William R. Cobb. I'm the system company president for American Water Works Service Co. The American Water Works Service Co. is part of the American Water Works system. We provide management, financial and engineering services to our operating companies throughout the United States. In New Jersey, our three operating companies are Commonwealth Water Co., Monmouth Consolidated Water Co., and the New Jersey Water Co.

Together, these three systems provide water to approximately 250,000 customers or roughly 1 million residents of the State. Our sources of water include 150 company-owned wells and six surface water reservoirs. In the specific case of Commonwealth Water Co., our own sources are supplemented through purchase contracts with Elizabethtown Water Co. and the Passaic Valley Water Commission.

We appreciate this opportunity to comment on the topic of water supply management in New Jersey. Our State is blessed with abundant water resources. Precipitation is normally on the order of 45 inches per year. We have extensive ground water sources in the southern portion of the State and the highly developed surface water supplies in the north.

Even though we are fortunate to have an adequate supply of fresh water we must manage this resource wisely. Proper and equitable management of our environmental resources is essential to New Jersey's continued well-being. We must be sure that our water supply resources are developed and utilized in a fashion consistent with the protection of the public health, safety and welfare.

The State of New Jersey has taken a strong leadership role in the development and provision of suitable water supplies. The State has developed a comprehensive water supply master plan to assure proper development of water supplies for New Jersey's future.

They have taken the lead in water system management and operations through the Water Supply Management Act and its associated rules, regulations and financing programs. The State has also shown its ability to address such water quality issues through the adoption and administration of the spill compensation fund and the newly adopted schedule for testing of hazardous contaminants, better known as bill 280. The State has recognized the benefits of private enterprise in the area of water supply by adopting the Water Supply Privitization Act.

Investor ownership in water supply facilities is quite common in New Jersey. We feel that our companies and many of the other larger investor-owned companies have done a superior job in the areas of water supply management, planning and operation. Our customers can rest assured that they will continue to receive an adequate quantity of high-quality drinking water. We have planned for our futures and we operate our systems today in a way in which the true cost of service is properly recovered.

New Jersey has formed the basis for a solid relationship between State government and the community of investor-owned water purveyors. The State has taken a comprehensive approach to regional management and planning issues.

We in turn, have taken an aggressive approach to proper planning and operation management. Given this relationship, we do not see the need for an active, Federal role in the management of water supplies in New Jersey. Although Federal involvement has been beneficial in many areas, we feel that Federal actions in statewide water supply management issues would only serve to interfere with the relatively effective system of supply management, development and distribution.

The tools for adequate resource management already exist in New Jersey. Our sources of supply in the southern portion of the State are more than adequate, even in times of drought. Through the State water supply authority, we have undertaken the construction of reservoir projects in the Raritan and Manasquan River basins. These reservoirs will provide significant protection against drought in the central portion of the State.

Construction of the Monksville and the Wanaque South project will provide similar protection in the northern part of New Jersey. There is also a good deal of activity in the Delaware River basin, Senator. The basin States, through the good faith agreements and the level B study, have committed to the construction of several projects which will assure adequate water resources for this region even in times of drought. The Francis E. Walter, the Prompton, and Merrill Creek projects will meet the needs of this growing region and assure adequate dry weather flows in the Delaware River.

As you know, the Merrill Creek project is being financed by private industry through the electric utilities users group.

Senator Bradley, we appreciate your interest in water supply issues and we hope we will have your continued support. Nevertheless, we do not feel that this is the time for Federal involvement in the management of New Jersey's water resources.

In closing, Senator, I would like to thank you once again for this opportunity to share our thoughts on this important issue. If we can be of any further assistance, feel free to call upon us.

Senator **Bradley**. Thank you very much, Mr. Cobb, for your testimony.

Now, Mr. Coldren.

## STATEMENT OF FRED COLDREN, CITY MANAGER, CITY OF CAPE MAY, NJ; ACCOMPANIED BY DAVID CARRICK, SUPERINTENDENT, WATER AND SEWER UTILITIES, CITY OF CAPE MAY, NJ

Mr. **Coldren**. Senator, Mr. Cobb is my big brother in this private enterprise. I'm the city manager of a tiny community at the southern tip of New Jersey, called the city of Cape May. And we are publicly owned, a muncipally owned, water service.

Senator **Bradley**. Not many people in Cape May these days.

Mr. **Coldren**. Not many, Senator.

The testimony on the national policy issues that we have heard today has been very helpful to me as a witness here and an observer, and I want to share some absolutely basic local and possibly mundane perspectives on the problem of delivering water to people.

This involves wells and pipes and leaks and meters and testing and rates and bills—and bills, and bills every quarter. And on behalf of the people of the city of Cape May, Senator, and our city council and one muncipally owned water system of some 620 in New Jersey, I want to commend the subcommittee, and particularly our own Senator for conducting these field hearings to listen to us, to hear our point of view and our recommendations.

You ask, Senator, what the Federal role is. I have a couple of comments on that, one of which is to keep up what you have already been doing. We are aware of your commendable efforts to create the Superfund bill in 1980 to try to clean up the toxic wastes that are contaminating our groundwater and our earth; your recent amendment or efforts in the area of trying to ban the use of lead in pipes and water systems is a worthy approach, and we can assure you that our system has complied, and I'm sure our big brother has also here in the American Waterworks Co., so keep up the work that you have done at the Federal level along the lines that you have already set out to do.

This presentation will be brief because I only have three specific recommendations. Our geography in Cape May City, as a peninsula sticking out into the ocean, with the Atlantic Ocean on the east and the Delaware Bay on the west, is a source of economic benefit to us, but it is also the cause of our major environmental problem. That is, salt water intrusion into our ground water supplies.

The water division of our city of Cape May Water Utility, which is headed by the superintendent, David Carrick, who I have here with me today, operates three—not 120—ground water wells on the cape island, and we have some 6,700 year-round customers instead of 250,000 customers, as my colleague here does have.

We have a seasonal population served by our water utility of approximately 35,000 people today in the middle of the summer, and we have approximately 40 miles or so of piping in four municipalities. And the U.S. Coast Guard training facility, which is also located in our city, have provided a little map to show the layout of our system.

We produce about one-half billion gallons of water a year, which is roughly equivalent to what New York City uses in 1 day, during the present allocation system. Fifty-six percent of our water is consumed during the 3 summer months. During the resort season, our average daily daily demand over the past 3 years has been almost 1.3 million gallons per day. It goes up to about 1.6 million gallons in the summertime, and we have had peak days in August summertime of approximately 2 million gallons.

With that background, I want to stress the reason I am here today, which is the salt water intrusion problem and what role there may be for the Federal Government in that. The large populations of four States and New York City are using the waters of the Delaware as a primary source of potable water. Those same waters mix with the ocean's salt water on the way down to us, and they are of no value to us in terms of potable drinking water when they get to the cape.

Similarly, underground streams of water in our aquifers and from the Pine Barrens are subject to degrees of salt water contamination as they get closer to the ocean. Our utility has had to abandon several major water wells in recent years due to high chloride concentrations.

One of the three active wells that we have now has such high chloride levels that we do not use it, and frankly could not use it for regular use, and we only use it now in the case of a major fire—and then only by mixing it with the water from other wells which have a better chloride count.

The construction of the Cape May Canal from the Atlantic Ocean to the Delaware Bay during the war increased salt water contamination to our tip of New Jersey significantly because it severed the aquifers that serve us, and it dropped the level of the water table by about 12 feet.

Our three wells are located in another municipality because all of the sources of water, pumpage from our own municipality and our entire service area, are depleted. And so while our two jurisdictions today are very working very closely together as good neighbors to solve our future water supply needs, I must report that that was not always the case, and it may not be the case at some distant point in the future, too.

So Cape May and our water system urgently needs additional sources of potable water to satisfy existing and foreseeable future demands on our water system. That need has existed for years, and a day of reckoning is fast approaching.

A few years ago, Cape May City applied to our neighboring municipality, Lower Township, which surrounds us, for permission to build a fourth new well that would have better quality for our residents, and we were turned down by the local planning board in a classic case of jurisdictional problems. And, based on that setback, we have had to initiate a sixfold program which briefly is conservation to reduce waste. That has been very effective, and the most effectives means of conservation we found was rate increase.

Second, zone changes to reduce density, and slow growth and water demand which has also been somewhat effective; consideration of increased overhead capacity in towers; negotiations with neighboring water utilities, the Wildwood Water Utility and the Lower Township Water Utility to try to work together as a region; examination of alternative well sites so we'd be less objectionable to our neighbors in our adjacent towns. And finally, desalinization techniques to take the brackish water that is produced from our present wells and turn it into potable water.

And finally, we are proud to be the home of the Nation's only U.S. Coast Recruit Training Center and other important Coast Guard facilities. Approximately one-fourth of the entire land area of our municipality is owned by the Federal Government and the Coast Guard facilities. These facilities have expanded, almost doubled, and have been improved extensively in recent years, and this expansion has occurred partly in reliance upon the city's ability to provide a future water supply for the growth of those Federal facilities.

There is a very significant Federal interest in our water supply problem which is largely salt water intrusion. Now, I am not along with my colleague here, an advocate of Federal involvement in zoning land use or in other concerns that should rightfully continue to be handled by the States and the localities.

While I felt it was important to point out those little jurisidictional problems that we have in our area, I'm sure they are repeated manyfold around New Jersey and around the Nation and it's important that the Federal Government is aware of those.

I'm confident we can resolve those locally without Federal involvement. There are, however, three specific Federal actions that I urge you, Senator, to consider. And they are as follows:

One, a simple amendment to the Clean Water Act of 1972 to put some teeth into the provisions of section 208, which I understand is supposed to encourage comprehensive areawide approach to water quality planning; and also you could extend the provisions of that act to something more than just "navigable waters." And also include the aquifer recharge zones. That would be an important amendment and could be done, I would think, with some support from other areas of the country.

My experience as a member of a planning board, as a city manager for many years, is that the 208 process is largely an academic one. It doesn't have a real significant impact on real life operations and developments at my level, at the municipalities level, and it has not had the intended impact on water supply coordination in a regional way.

Second, we'd like to have your support as our Senator to encourage the EPA Administrator to invoke the provisions of the Gonzalez amendment to the Safe Water Drinking Act of 1974 which would declare the three main aquifers of Cape May County, which is the Conhansee, the Holly Beach, and the Cape May aquifers as a single aquifer, and recogize that these three formations serve 80 percent of all the water needs of our county, and that by this declaration as a "sole and principal drinking water source" all future federally funded projects would have to have an environmental impact or assessment statement done.

I feel that a lot of the expansion of the Coast Guard would have needed such a review prior to their construction, and also such a declaration by the EPA Administrator would focus attention on the salt water intrusion problems of our city and probably hundreds of similar water utilities around the country on the Atlantic and Pacific and gulf coasts.

And, finally, I would ask that the Federal Government, through this committee's actions, assist coastal water utilities to install desalinization facilities and try to help make them cost-effective for the treatment of brackish water produced from existing sources.

Just as the Federal Government has a role in assisting other segments of our society, that is, big cities and farmers and in rural areas and flood-prone zones and all the others with very unique problems, I think that you should consider establishing a Federal priority to assist Atlantic, Pacific, and gulf coastal water utilities in areas with our unique problem, which is salt water intrusion.

I want to thank the subcommittee for the opportunity to present these three specific recommendations and to appear today.

[The prepared statement of Mr. Coldren follows:]

Statement of

# Fred Coldren, City Manager

of the

# CITY OF CAPE MAY, N.J.

and the

City of Cape May Water & Sewer Utility

at a Public Hearing of the

## United States Senate
## Subcommittee on Water and Power

of the

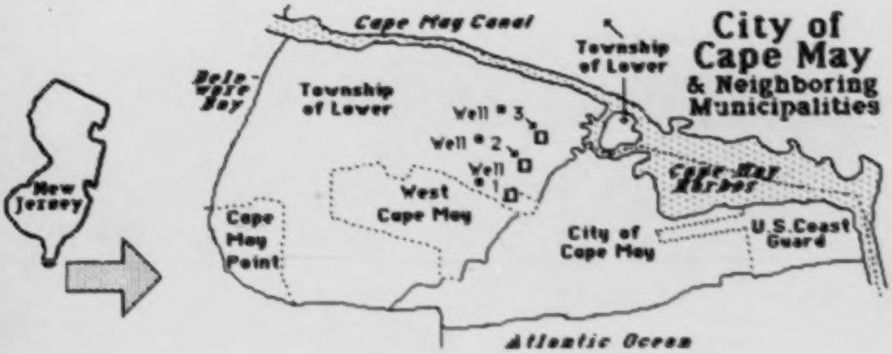
ENERGY AND NATURAL RESOURCES COMMITTEE

by invitation of

## U.S. SENATOR BILL BRADLEY

of New Jersey

August 7, 1985
CHERRY HILL, NEW JERSEY


City of
Cape May
& Neighboring
Municipalities
Cape May Canal
Township of Lower
Dela-ware Bay
Township of Lower
Well • 3
Well • 2
Well • 1
New Jersey
West Cape May
Cape May Point
Cape May Harbor
City of Cape May
U.S. Coast Guard
Atlantic Ocean

For half a century and longer, most Americans including residents and visitors to the City of Cape May, the 'National Historic Landmark' seashore resort at New Jersey's southern tip, have taken the abundant, reliably pure, and cheap supply of potable water for granted.

**But finally now in this decade, the realities of water availability, water quality, and related problems and costs are dawning on all but the least aware of us.**

> On behalf of the people of the City of Cape May, our City Council and municipally-owned Water Utility, I want to commend this Subcommittee, and particularly our own Senator Bill Bradley, for conducting these field hearings to listen to our problems and suggestions, and to share ways that we can best insure a safe and abundant future supply of potable water for our respective constituents.

Senator Bradley, we are all aware of your commendable efforts to create the Superfund in 1980 to try to clean up toxic waste sites that are contaminating our earth and water supplies. Also, your recent amendment to ban the use of lead solder and lead pipes in new water systems is a worthy approach to help eliminate lead contamination of drinking water through the corrosive action of water on pipes, fittings and solder. **Keep up the good work along these lines.**

> **This presentation will be brief, for I have but THREE SPECIFIC RECOMMENDATIONS for federal attention.**

Our geography as a peninsula surrounded by the Atlantic Ocean to the east and the Delaware Bay to the West is a major attraction and blessing to our resort economy, but combined with the fact that a federally-constructed canal from the Ocean to the Bay has transformed greater Cape May into an island, **geography is also the primary source of our potable water problems.**

The water division of our City of Cape May Water and Sewer Utility operates three groundwater wells in the Cohansey aquifer. Potable water is distributed to some 6,700 year-around residents plus an estimated seasonal population of 35,000 persons through 40 or so miles of piping in the City of Cape May, the Boroughs of West Cape May and Cape May Point, the extensive U.S. Coast Guard facilities which are located in our City, and portions of Lower Township which surrounds our water service area.

We produce about one-half billion gallons of water a year, with 56 percent being used during the three months of June, July and August. Our average daily demand over the past three years has been almost 1.3 million gallons of water per day (mgd), and an average of 1.6 mgd during the summer with occasional hot summer day demand in excess of 2.1 million gallons.

**With that background, Senator, I bring the problem of SALT WATER INTRUSION into our water supply to your attention.**

While large populations of four states and New York City use the waters of the Delaware as a primary source of potable water, those same waters mix with the Ocean salt water well before they reach the Cape.

Similarly, underground streams of fresh water from the pine barrens and the major aquifers are subject to various degrees of salt water contamination under Cape May County from the Atlantic Ocean and Delaware Bay. Our utility has had to abandon several major water wells due to high chloride concentrations. One of our three active wells now has such high chloride counts that we only use it in case of an emergency such as a major fire, and then only by mixing it with other less saline water.

The construction of the Cape May Canal increased saltwater contamination significantly because it severed aquifers and caused a twelve foot drop in the water table along the canal.

Our three wells are physically located in another municipality: Lower Township. While our two jurisdictions are working together as good neighbors at the present time to resolve mutual problems, including water supply issues, and while I hope and expect that cooperation to continue in the future, such was not always the case and we must realistically be prepared for conflicting interests someday in the future.

**Cape May urgently needs additional sources of potable water to satisfy existing and forseeable future demands on the water system. That need has existed for years and the day of reckoning is fast approaching.**

A few years ago, the Lower Township Planning Board denied an application for a new well to serve the City of Cape May water utility service area. That well would have been located north of Cape May Canal, but fears that the new well would adversely affect a number of private wells and the Township's own future supply were expressed and led to the denial.

**Since that JURISDICTIONAL setback, the City of Cape May has pursued six alternatives:**

(1) Conservation to reduce waste and use.
(2) Zoning changes to reduce density and slow growth in water demand.
(3) Consideration of increased overhead storage.
(4) Negotiations with our neighboring water utilities (both Lower Township and Wildwood) concerning possible interconnection of systems where Cape May could buy water at a bulk rate for resale to our accounts.
(5) Examination of alternative well sites that would be less objectionable to our neighbors' interests.
(6) Desalinization technologies to produce potable water from brackish well water.

Finally, we are proud to be the home of the nation's only U.S. Coast Guard Recruit Training Center and other important Coast Guard facilities. Approximately one-fourth of the land area of the City of Cape May is owned by the federal government. The federal facilities have expanded and been improved extensively in recent years, and this expansion has occured partly in reliance on the City's ability to provide potable water in the future. **And so there is a SIGNIFICANT FEDERAL INTEREST in our water supply problems.**

I am not an advocate of federal involvement in zoning, land use or other concerns that should rightfully continue to be handled by the states and local governments. While I felt it was important to point out the jurisdictional problems which local water utilities do face, I anticipate and am confident that these can be resolved locally.

**There are, however, THREE SPECIFIC federal actions that I ask Senator Bradley and the members of this Subcommittee to consider:**

1. **AMEND THE CLEAN WATER ACT OF 1972** to put some teeth into the provisions of Section 208 which is supposed to encourage a comprehensive area-wide approach to water quality planning, and extend the protections of the Act from just "navigable waters" to include aquifer recharge zones. My experience is that at present, the 208 process is largely academic and has not had the intended impact on water supply coordination.

2. **ENCOURAGE THE EPA ADMINISTRATOR TO INVOKE THE PROVISIONS OF THE GONZALES AMENDMENT** of The Safe Drinking Water Act of 1974 (42 U.S.C., Sec. 300(h)-3(e) (1976)) to declare the Cohansey, Holly Beach, and Cape May formations as a single aquifer which is a "sole or principal drinking water source" which, if contaminated, would create a significant hazard to the public health. Fully eighty (80%) percent of Cape May

County's potable water is produced from these formations. This action would focus attention on our salt water intrusion problem, and it would require a thorough environmental assessment of all federally funded projects above the aquifer. There are no doubt other areas where such designations would be similarly appropriate.

3. **ASSIST COASTAL WATER UTILITIES TO INSTALL DESALINIZATION FACILITIES** for the treatment of brackish water produced from existing sources. Just as the federal government has a role in assisting other segments of society (big cities, rural areas, farm areas, flood prone zones, etc.) with their unique problems, consider establishing a federal priority to assist Atlantic, Pacific and Gulf coastal water utilities, such as ours, that face salt water intrusion into their water supplies. The federal EPA does have the experience of various demonstration projects that have been accomplished at other coastal areas with nearly the same salt water intrusion problems that we face. Technical assistance and any planning or construction funding that may be available will help.

I thank the Subcommittee for this opportunity to share our thoughts and recommendations with you. We hope our presentation will somehow assist.

Fred Coldren

Cherry Hill, New Jersey
August 7, 1985

**Senator Bradley.** Thank you very much, Mr. Coldren.

I have just a few questions for each of you.

Let's start with you, Mr. Coldren, just to get some information. What desalinization technology do you use?

**Mr. Coldren.** We do not have one at present. We're exploring a number of options. There are a several technologies, one of which is the reverse osmosis that some of our citizens' groups are actively urging that we consider. It is being used in areas of Florida.

**Senator Bradley.** If you had to finance this, what would be the rate increase?

**Mr. Coldren.** Significant. The current estimate is that it would be about a $1 increase per thousand gallons.

**Senator Bradley.** One dollar.

**Mr. Coldren.** Yes, sir.

**Senator Bradley.** And what is the cost now per thousand?

**Mr. Coldren.** $2.55 per thousand gallons for water sold to every user in Cape May without any differentiation between bulk users.

**Senator Bradley.** Does that include sewage costs?

**Mr. Coldren.** No, sir. That is just water.

**Senator Bradley.** So that earlier we had testimony that for consumptive water, it was 6 cents a thousand gallons. And yours is a dollar?

**Mr. Coldren.** Ours is $2.55 and we are where the real bills are paid, right at the local level.

**Senator Bradley.** That is the cost of the water, not any other folded-in costs?

**Mr. Coldren.** No, sir. That is strictly the cost of producing the water from the three wells that we have, of providing it throughout distribution systems and pipes to the homes of our coverage area.

**Senator Bradley.** Mr. Cobb, although you said you didn't see any Federal role in the New Jersey water management issue, I assume you did not mean that you did not support the USGS hydrological research or technical assistance; is that correct?

**Mr. Cobb.** That's correct.

**Senator Bradley.** When you look at long-range planning questions, do you think there's a difference for a privately owned investor utility and public systems?

**Mr. Cobb.** Speaking from an investor-owned standpoint that I've been with for the past 25 years, we keep an updated comprehensive planning study for all of our properties, and normally we look out into the future about 15 years.

But if circumstances warrant due to growth or water supply problems, quality problems, naturally we take a pretty current review of those circumstances to enable us to keep a pretty current evaluation of where we're going.

**Senator Bradley.** How have your rates changed in the last 10 years?

**Mr. Cobb.** The rate structures in our system, it goes without saying that when you look at the southern portion of New Jersey where the primary source of supply is ground water, naturally you're dealing with a situation where it's far more inexpensive to supply than it is for a surface supplier.

Facilities are altogether different. In some cases, southern New Jersey may have a well supply that, with a simple addition of chlorine, would be to pump that water directly into the system. In other cases where there might be a high content of iron and manganese in the water, there is some filtration involved.

But yet, when you look at a surface supply that starts with probably less quality than the ground water supply and the pumping and purification facilities and the cost of coagulation and chemical treatment, et cetera, normally speaking, surface supplies will cost more.

And normally your capital investment is greater in the surface supplies. So in recent years, depending on the magnitude of the investment, our rates have gone up anywhere from every 12 months to every 15 months, depending on circumstances.

Senator **Bradley**. Do you have a percent increase that you could cite over the last 10 years, just for the committee to focus on?

Mr. **Cobb**. I would say the companies that I'm familiar with, probably in the last 10 years the cost of water has probably gone up anywhere from 40 to 60 percent.

Senator **Bradley**. As an investor-owned water company operating in south Jersey, with primarily ground water sources operating in and around the Pinelands, do you ever have visions of becoming a water exporter?

Mr. **Cobb**. I would answer that question in light of the fact that it's a know fact that there is a plentiful supply there, and that would certainly be an alternate source of supply for the future of the State of New Jersey.

Senator **Bradley**. We had testimony at our first hearing from USGS and the Bureau and the Corps and all the people who asserted that it would be cheaper to augment the surface water systems of New Jersey than it would be to produce and transport ground water from areas where it's plentiful in New Jersey.

First, is it plausible to you? And second, why haven't you done it?

Mr. **Cobb**. Well, the term a few moments ago was used of conjunctive use. Maybe this is what you're addressing. It's a combination of ground water and surface water, I think, due to the quantity in some cases, quality in other cases.

One of the comments that was noted a few moments ago was the critical areas, and the gentleman was from Monmouth County. I am somewhat familiar with Monmouth County. The idea here was to rest the wells a certain period of time to permit the aquifers to replenish themselves. And in those cases, we intend to use more surface supply in conjunction with ground water supply to preserve the resources that we have.

I think it's just inevitable that we will be using ground water and surface supply in conjunction with one another.

Senator **Bradley**. If you were going to increase the use of existing ground water in New Jersey as a company, what would you do? What steps would you take?

Mr. **Cobb**. I think you'd have to look at the areas that the State has considered critical areas, as opposed to the areas where the stress on the aquifers are not as great as they have been in maybe some of the areas, and certainly it's a fact that in concentrated areas, there's an overdrafting of some of the ground water. There certainly is a strong possibility of bringing in water from maybe a few miles away, anywhere from 50 miles to 100 miles or whatever, if that's what's necessary.

I think that's something that's a consideration.

Senator **Bradley**. How would you get the water from the Pine Barrens to northwest New Jersey that now depends totally on surface water?

Mr. **Cobb**. Normally, in transmitting large quantities of water, it has to have some kind of transmission mechanism.

Senator **Bradley**. You mean a pipeline?

Mr. **Cobb**. Yes.

Senator **Bradley**. Let me ask one last question of Mr. Coldren. You recommended that section 208 be modified to include not simply navigable water, but to include what other?

Mr. **Coldren**. The aquifer recharge zones.

Senator **Bradley**. OK. And anything else?

Mr. **Coldren**. That was the primary interest there.

Senator **Bradley**. And then you want Federal dollars to help you with desalinization?

Mr. **Coldren**. Well, I think it's a problem that does cross State lines, and I think that it is something that is felt on both coasts and possibly the Gulf area. I'm not too sure about that.

But it's not unique to our area.

Senator **Bradley**. Tonight I'll go over the map and check the number of States that border salt water and see if I can get 51 votes that way.

Let me thank both of you for your testimony and also the entire witness list today. I think this has been a very helpful hearing, and I have personally learned a lot. I think the committee will benefit greatly from your perspectives and I hope that we will be able to continue the dialog.

The committee is adjourned.

[Whereupon, at 12:38 p.m., the hearing was adjoured.]

# APPENDIX

## Additional Material Submitted for the Record

---

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 27 1984 AM 10 49

OFFICE OF
WATER

The Honorable Frank H. Murkowski
Chairman
Subcommittee on Water and Power
Committee on Energy and Natural Resources
United States Senate
Washington, DC 20510

Dear Senator Murkowski:

EPA is pleased to respond to your request for information on technical assistance opportunities available to deal with drinking water quality problems in the Delaware River Basin.

As you may be aware, EPA's Regional offices have established close working relationships with State governments through the State-EPA Agreement process. Responsibility for drinking water quality issues lies in the Drinking Water Branch of each regional office. The Region II office works with New York and New Jersey; Region III with Pennsylvania and Delaware. The Water Supply Branch Chiefs for each are Walter E. Andrews and Joseph Piotrowski, respectively. Their staffs have technical expertise in drinking water issues as diverse as water supply engineering and the health effects of organic chemical contaminants. In addition, expertise in ground water issues is available through the newly established ground water programs in each region. The Ground Water Program Coordinators for each region are William Pedicino, Region II, and Thomas Merski, Region III.

Specialized technical assistance is also available from EPA's Headquarters' staff. The Office of Drinking Water provides information to States, local governments and private citizens, often with regard to the health effects of chemical contamination. One of the most important technical assistance elements provided by this office is the health advisories' program. Health advisories are now available for a number of commonly found drinking water contaminants. These advisories provide information on the risk posed by the contaminants as well as guidelines on what levels of contamination are considered unsafe. Although EPA is now in the process of developing enforceable drinking water standards for many of the chemicals for which health advisories exist, the advisories continue to provide initial guidance on how and when to respond to contamination.

Another technical assistance element available from EPA is certification of laboratory facilities. When contamination is found in drinking water, it is important to know that the chemical analysis used was accurate and precise. This is especially important when error can lead to greater public concern than warranted. The laboratory certification program and associated quality assurance elements help ensure high quality analysis in every state.

In addition to drinking water quality programs, EPA provides assistance for multimedia pollution control programs under several environmental acts. The Office of Solid Waste and Emergency Response administers both the CERCLA (Superfund) and RCRA legislation. Both of these programs provide for remediation activities if drinking water is adversely affected from waste disposal or industrial activities. Over half of the current superfund sites involve contaminated ground water.

The Clean Water Act is also available to deal with some water quality problems. In FY85 $7 million is available in grants to the States to assist ground water related activities. Specifically, over $750,000 has been targeted for those states which make up the Delaware River Basin. New Jersey will receive $157,500 for state designated ground water projects. New York is using $260,000 to initiate a pesticide contamination evaluation program and conduct aquifer mapping and assessment. Pennsylvania, allotted $233,800, is developing implementation guidance for ground water strategies and is updating its current strategy. In addition, the State is developing implementation guidance for ground water monitoring and is preparing a monitoring pilot project. Delaware is slated to receive $100,000 which it will use to develop a ground water classification system, a monitoring plan, and a data management system. They will also use some of these funds to study the surface water/ground water contamination interface.

In addition to specific state intiatives, EPA is working with the Delaware River Basin Commission regarding a grant to support ground water initiatives in the basin. It is the Delaware Commission which is the leader in protecting surface and ground waters in the basin, especially with regard to the exclusion of tidal salt waters from water supplies, both surface and ground.

Provision of technical assistance constitutes an important EPA responsibility. This is, of course, only one element of our drinking water program. A brief introduction to the full set of programmatic responsibilities is presented in the attachment.

If you or the members of the Subcommittee become aware of new opportunites for EPA to assist state and local entities, please let me know. Further, if EPA can be of additional assistance to the Subcommittee, we will be happy to respond.

Sincerely,

Henry L. Longest II

Acting Assistant Administrator
for Water (WH-556)

Enclosure

## ATTACHMENT

## STATUTORY AUTHORITIES

The federal government has long played a role in regulating the quality of our drinking water supplies. Federal guidelines for protection of human health were first adopted by the Public Health Service in 1914 and were periodically revised and expanded through 1962. In 1974, Congress enacted the Safe Drinking Water Act in response to two emerging problems, the wide discrepancy in the nature of state programs to oversee drinking water systems and the detection of organic contaminants in drinking water, about which little was known and for which new standards were thought to be needed.

The Safe Drinking Water Act mandates two major programs:

- The Public Water Systems Supervision program.

  - EPA must set standards for drinking water contaminants that public water systems must meet. The standards include a maximum contaminant level and a minimum monitoring frequency, or, when routine monitoring at the utility level is not feasible, treatment requirements to reduce undesired contaminants.

  - Public water systems are defined as any entity that provides water for human consumption and serves at least twenty five people or fifteen service connections.

  - The law envisioned standard setting in two phases. First, the Agency was to promulgate interim regulations based on a quick update of the 1962 Public Health Service guidelines dealing with the traditional contaminants of concern. Second, the Agency was to promulgate revised standards including an update of the interim standards and such additional standards as necessary to include all contaminants which may have an adverse effect on public health.

  - The process for establishing revised standards as specified in the law includes two successive steps:

    1 - The Administrator proposes health goals, called recommended maximum contaminant levels (RMCLs), for each contaminant which in his judgement may have any adverse health effect. The RMCLs must be set at a level at which no known or anticipated health effect can occur.

    2 - The Administrator then establishes enforceable standards called maximum contaminant levels (MCLs) set as close to the RMCLs as feasible, taking cost

into consideration. If the level of the contaminant cannot be ascertained (for technologic or economic reasons) the Administrator must prescribe treatment techniques which will reduce the level of the contaminant to an acceptable level.

- The standards become enforceable 18 months after promulgation.

- The systems are required to conduct periodic monitoring and report results to EPA or the states and to provide public notice to their customers, whenever required monitoring is not conducted or when the standards are exceeded.

- EPA can delegate the program to a state if it adopts regulations that are no less stringent than the federal regulations.

- The Underground Injection Control Program

  - EPA must set minimum requirements for state programs designed to protect underground sources of drinking water from endangerment by underground injection of fluids through wells.

  - An effective state program must include inspection, monitoring, recordkeeping and reporting requirements.

  - All underground injection wells must be subject to authorization by permit or by rule.

  - The regulations may not interfere with or impede oil and gas production unless the requirements are essential to protect underground sources of drinking water.

  - If a state does not meet the minimum requirements, EPA must promulgate a specific program for that state.

  - For oil and gas related injection, states may choose to demonstrate that they have an "effective program", rather than meet the minimum federal requirements.

In addition to these two major programs the SDWA provides various authorities to the Agency.

- Protection of Sole Source Aquifers

Sole source aquifers are those that are the sole or principal source of drinking water for an area, the contamination of which would create a significant hazard to public health. Once the Administrator has, on his own initiative or upon petition, published in the Federal Register a determination that an area is a sole source aquifer, no Federal financial assistance may be granted to any project unless the project is designed to assure no contamination of the aquifer. In practice, such designations lead to increased concern for ground water within EPA's review of Environmental Impact Statements.

- General authorities

The law provides EPA with general authority to conduct research and studies to support standard setting and with a variety of enforcement tools to deal with violations of standards and and regulations, as well as emergencies whenever public health is threatened due to contamination of a public water supply.

## GLOSSARY

1. Public Water System (PWS) - a system which provides piped water for human consumption which has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. Two types: Community and Non-community.

2. Community Water System (CWS) - a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. (Essentially, those systems providing water to people in their principal residence).

3. Non-community Water System (NCWS) - a public water system other than community systems, typically serving a transient population. (Essentially, "systems" providing water to summer camps and resorts, schools, gas stations, etc.).

4. Very Small System - A community system serving less than 500 persons.

5. National Interim Primary Drinking Water Regulations (NIPDWR)- Standards adopted immediately after passage of the Act and based primarily on Public Health Service regulations. By statute, they were to be revised based on National Academy of Sciences recommendations.

6. Primary Drinking Water Regulation - A regulation which

    1- specifies contaminants which may have an adverse effect on health of persons;

    2 - specifies either a maximum contaminant level or a treatment technique; and,

    3 - specifies procedures for quality control, testing, proper operation and maintenance.

    Primary Drinking Water regulations are enforceable.

7. Secondary Drinking Water Regulations - regulations which relate to taste, odor and appearance and are designed to protect welfare. They are not enforceable.

8. Recommended Maximum Contaminant Level (RMCL) - a health goal for contaminants set at a level at which no known or anticipated adverse health effects occur, allowing for an adequate margin of safety.

9. Maximum Contaminant Level (MCL) - the maximum level of a contaminant permitted in water delivered to any user of a public water system.

10. Variance - relief granted to a system because the quality of raw water is so poor that a MCL cannot be met, despite the use of best available treatment technology, taking cost into account. Not granted if an unreasonable risk to health results. Can be indefinite.

11. Exemption - relief granted to a system due to compelling factors (which may include economic factors). Not granted if an unreasonable risk to health results. The deadline for attaining compliance has now passed and, therefore, exemptions are no longer available.

12. Persistent Violator - a system which violates the bacteriological or turbidity MCL for a contaminant for four or more months in any twelve month period. (Relates to the same contaminant. Violators are not considered persistent if they violate different MCLs within the four-month period).

13. Intermittent Violator - as above, but for three or fewer months.

14. Primacy - the status of a state having been delegated primary enforcement responsibility for administering the Safe Drinking Water Act. Requires states to adopt regulations no less stringent than EPA's.

15. Direct Implementation - the implementation of the drinking water program by EPA in a state which does not have primacy.

16. Health Advisory - Toxicological guidance provided to states to help them deal with a contaminant for which no standard exists.

17. Underground Source of Drinking Water (USDW) - an aquifer which supplies a public water system or contains a sufficient quantity of water to supply a public water system and contains water with less than 10,000 mg/l total dissoved solid, about three times saltier than any water presently used for drinking purposes.

18. Sole Source Aquifer - an aquifer which is the principal source of drinking water and which, if contaminated, would create a significant hazard to public health.

## THE PUBLIC WATER SYSTEM SUPERVISION PROGRAM

### Development of regulations

- Interim Primary Drinking Water Regulations were promulgated in 1975, and amended in 1976, 1979 and 1980. They include standards for:

    - Nine inorganic chemicals;
    - Six pesticides;
    - Turbidity and microbiological contaminants;
    - Radioactive contaminants; and
    - Disinfection by-products trihalomethanes (THMs).

- Regulations are being revised in four phases.

  Phase I - Volatile synthetic organic chemicals (VOCs) which are most commonly found in instances of ground water contamination. Proposed RMCLs were published in June 1984. Final RMCLS and proposed MCLS should be published in May 1985, and final MCLS will follow in April 1986.

  Phase II - These regulations address a required reconsideration of the interim standards (about 20 contaminants) and an equal number of new organic chemicals, mostly pesticides. We anticipate RMCLs proposal in May 1985, followed by final RMCLs and proposed MCLs in June 1986, and a final MCL in October 1987.

  Also included in Phase II but on a different track is fluoride. We anticipate RMCL proposal in April 1985, followed by final RMCL and proposed MCL in December 1985, and final MCL in October 1986. (This schedule is the subject of on-going litigation and may be resided.)

  Phase III - This phase includes radionuclides. A schedule has not been developed, but we anticipate starting regulatory development later this year. It will include an update of existing standards and new standards for radium and radon.

  Phase IV - Includes the development of regulations for disinfection by-products, including a reconsideration of the existing THM standard. Regulatory action will begin in 1986, based on new science currently under development.

## Health Advisory Program

- The current standards do not encompass all contaminants found in drinking water.
- With increasing frequency, synthetic organic chemicals are found in drinking water supplies using ground water sources.
- For these "unregulated contaminants" EPA provides Health Advisories, under its general authority to provide technical assistance to states, designed to provide guidance on levels of health concern for contaminants so that states may detemine appropriate reaction to detected contamination.
- Health Advisories are:
  - Guidance and not federally enforceable;
  - Strongly supported by states and utilities; and
  - Used by other programs, such as Superfund in dealing with requests for emergency assistance.
- Typically, a health advisory identifies the no-adverse-effect levels over the short and long term. For carcinogens advisories are presented as a broad range of values, allowing the states to decide how protective they want to be.
- Since Health Advisories are guidance and not regulations, they can be developed more quickly and are useful to states until national standards can be developed where appropriate.

## Status of Delegations

- All 57 states and territories are covered by the program. Fifty-two states or territories have been delegated primary enforcement responsibility (primacy), and approval of the Pennsylvania program is currently moving through the Agency clearance process.
- States have played a major role in this program from the beginning, which helped us achieve this high level of delegation.
- EPA regional offices administer the program in the District of Columbia, Indiana, Oregon, and Wyoming.
- EPA is also responsible for oversight of the water systems of federally-controlled Indian Lands.

Characteristics of the water supply industry.

- 59,000 community water systems serve over 200 million people in the United States on a daily basis. There are more than 158,000 non-community systems which serve the traveling public.

- 11,000 community water systems (19%) use surface water as a primary source; 48,000 community water systems (81%) use ground water as a primary source.

- Almost two-thirds of the community water systems serve 500 or fewer people; these systems supply only 2.6% of the people served by community water systems. On the other hand, one half of one percent of the water systems serve over 100,000 people each, providing water to 44% of the people served by community water systems.

- While the larger systems are generally publicly owned, the very small systems are generally privately owned and lack the financial and technical resources to provide complete treatment.

- Dealing with a regulated universe which includes a high percentage of very small systems is a major challenge to the program.

Compliance with the Standards

- Full compliance with the standards means that a systems meets the standard and complies with the prescribed monitoring and reporting requirements.

- In FY 1983 - 71% of the systems met all these requirements for the microbiological standards. This was up from 63% in FY 1980.

  - There was a reduction in persistent violators, as well. In FY 1983 the persistent violators represented 8.8% of the systems, down from 14.3% in FY 1980.

- Systems are more likely to violate the monitoring and reporting requirements than the MCLs. Of those that violate the monitoring requirements, most violate them only intermittently rather than persistently.

- Our compliance strategy for the program is to have the States:
  - force all systems to monitor;
  - formulate a judgement as to the immediacy of the health risk where the standards are exceeded;
  - assess alternatives most appropriate to the situation;
  - move the systems into compliance wherever feasible.

- Compliance problems have historically been handled primarily through informal mechanisms such as warning letters, telephone calls or site visits. When these fail, the states or EPA will resort to litigation. Thirty seven enforcement cases were referred to the Department of Justice during FY 79-84, which is a major new step for many of the states.
- The lack of authority for administrative orders and penalties limits our enforcement options especially in dealing with monitoring violations among small systems.
- The program has had major success in getting the states to use on-going compliance data as a management tool to identify problem areas and allocate resources for follow-up actions.
- To support state and regional programs, the office has developed two data processing systems, one called MSIS to store inventory information and compliance monitoring data and another called FRDS to prepare national summary reports on program status.
- Improving the completeness and accuracy of the compliance data base is an important aspect of the program management. It is being done through:
    - Data verification audits in which raw data from lab records of a random sample of systems is checked against results actually reported to EPA; and,
    - Training in data analysis and usage for regional and state program personnel.
- For FY 85, the Agency included state-by-state compliance strategies and specific targets for improvement in compliance rates in all program grants.

LEAGUE OF WOMEN VOTERS
OF MONMOUTH COUNTY, N. J.

July 31, 1985

Subcommittee on Water and Power
Committee on Energy and Natural Resources
U. S. Senate
Washington, DC 20510

Gentlemen:

The League of Women Voters of Monmouth County, New Jersey, appreciates your invitation to discuss the recent problems of water supply in this area that have become especially apparent during the current drought. We hope our comments can be read into the record of the proposed hearings.

It is our feeling that neither the State of New Jersey nor the Delaware River Basin Commission have been lax in planning for a water shortage nor remiss in implementing plans.

Since the severe drought of the early '80s both of these bodies have worked consistently toward correction of a shortage problem. What has held up implementation more than anything else is the process of public participation - a very important process, but one that I am sure you have observed throwing occasional cogs in the wheels of progress.

It took New Jersey a very long time to get its Water Supply Master Plan successfully passed and to set up an acceptable Water Supply Authority to provide funding and oversee construction of planned facilities. I have worked on the Citizens' Advisory Board appointed to advise the consulting firms hired by the Authority to plan for the Manasquan Reservoir. That project had first been proposed in 1956 and other than acquisition of land nothing was done toward implementation until the Statewide Water Supply Master Plan was passed and the opponents of the idea of developing the Manasquan system (mostly people from north Jersey) were finally satisfied. Then for a year and a half the many consulting firms, the Advisory Board and citizen members of subcommittees met to discuss favored proposals and alternatives and to assist in ultimate decisions.

As far as the State is concerned, they felt that all planning efforts had been completed and requested necessary permits from the DEP and the Army Corps of Engineers. The DEP approval was granted. The Corps is holding progress up in order to prepare its own EIS on the proposal. Meanwhile the State has been going ahead with other projects including much-needed dredging of the Delaware and Raritan Canal for potable water supply and establishment of additional interconnections in north Jersey.

The State has also produced an in-depth plan to conserve groundwater in the coastal area of the state and wide publicity accompanied by hearings have been offered. Strict conservation measures, as, of course, you are aware, have already been enforced in northern New Jersey and a similar 3-tier plan has been prepared for critical areas along the coast. However, until the Manasquan and possibly one or two new supplies from small companies come on line, there is very little Congress or anyone else can do in this area other than to practice conservation.

It must be pointed out that during the study and planning for the Manasquan, Monmouth County and the State have worked closely with the Soil Conservation Service and the U. S. Geological Survey. Consulting firms have been specialists in engineering; business management; geology; fish, wildlife and vegetation; dam construction; hazardous pollution control; etc. The Army Corps of Engineers has regularly sent a representative to the Advisory Board meetings. It would seem that, possibly, the Congress could take action with the Corps so that progress can be made on construction which is crucially needed not only at present, but to serve a continually growing population, in the immediate future.

The Monmouth County League knows a great deal less about the activities of the Delaware River Basin Commission, but do know that it has been working through the same arduous process of public hearings on a number of dams on tributaries of the main river. At least some of these are designed to prevent salt water from reaching Philadelphia and Trenton. Philadelphia draws much of its supply from the river.

Of course, the current severe drought has revived talk of the need for the once-refused Tocks Island Dam. The League of Women Voters has been a leading opponent of that project. We do not believe in the wisdom of constructing a dam on the mainstem of a major river because of the adverse effects on its natural function. These include deprivation of the normal cycle of flooding to the productive estuary, the possibility of raising the salt interface, effects on the productivity of the coastal wetlands and on the riverine flood-absorbing value of floodplains.

In addition to the potential adverse effects, the League's study found that the demand for electricity in the basin does not require the need for the dam to produce hydro-power. We have constantly found the dam to be an extremely costly boondoggle that would totally change the character of the river which currently provides ample recreation for citizens of the surrounding area and a relieving natural beauty for citizens of urban centers.

Other than urging the Army Corps to get on with production of its EIS for the Manasquan or to accept that prepared by the consultants using collected material from all the firms involved, the League of Women Voters of Monmouth County can see no need for action on the part of the Congress in this area.

We thank you for this opportunity to comment.

Very truly yours,
Kathleen H. Rippere
Kathleen H. Rippere,
Natural Resources Chairman

934 Navesink River Road
Locust, NJ 07760

Re: SENATE ENERGY COMMITTEE, SUBCOMMITTEE ON WATER AND POWER, HEARINGS, "WATER SUPPLY ISSUES IN THE MID-ATLANTIC STATES"

AUGUST 7, 1985: DELAWARE RIVER BASIN STATES

I. BACKGROUND OF ISSUES. Delaware River Basin's problem is that of a geographically very small river basin trying to supply the water needs of an immense number of people. Its mainstem is only 175 River miles long down to sea level, at Trenton; with 7 million people in its Basin plus 9 million outside it, in NYC and North Jersey, dependent on its flow.

(A) 1931. Its problem began in the early nineteen' thirties, after the Supreme Court concluded New York City, over in the Hudson River's Basin, could construct two Reservoirs up at the top of the Delaware Basin's portion in New York State, and divert its headquarters over to NYC -- provided, NYC released enough water from its Reservoirs to prevent the Delaware mainstem's flow from falling below the minimum then required during drought by this Basin's three downstream State areas that (unlike NYC,) are solely dependent on the Delaware. This, though, being on the Court's Decreed provision that NYC be required to reduce its diversion of Delaware Basin's water when its three lower Basin State areas' future need for increased water so requires. This was 1931, before World War II.

(B) 1954. Following which, in 1954 the Court amended its Decree, to let NYC increase its diversion of the Delaware to 800 million gallons a day (mgd); and NJ to divert 100 mgd of the mainstem's flow above Trenton over to trans-basin NJ. This being on the Decreed provision that NYC build a third Reservoir, and release enough water from all three sufficient to prevent the Delaware's flow during drought from dropping below 1,750 cubic feet a second (cfs) measured at Montague just below NY's border. That, 1750 cfs, being sufficient to support NJ's 100 mgd diversion of it below Montague, and meet the three lower Basin State areas' people then-minimum, 1954, needs for the Delaware during drought. And this Amendment also being on the Decreed provision that NYC and or NJ be required to reduce or discontinue diversion of this Basin's water when its three lower Basin State areas' future need for increased water so requires.[1]

---

[1] In their briefs filed with the Supreme Court Master: State of "Delaware took substantially the same position as that of Pennsylvania." Both insisted that NYC maintain that 1,750 cfs mainstem minimum flow to them before or if it would divert any of this Basin's water; and that NYC's diversion of any of it can continue only legally temporary in nature. Because "future development ... within the borders of [PA and DEL] (footnote cont'd on next page)

(C) 1961. Following this Amended Decree, in 1961 the four Basin States adopted on interestte "Delaware River Basin Compact". By this, to last 100 years, all agreed: (1) not to go back to Court to litigate future water use of the Delaware, (2) to live with that Decree- required minimum 1,750 cfs NYC maintenance of the mainstem's minimum flow to the lower Basin during drought, and (3) to support construction of the 1954 Decree reservoir in the Delaware mainstem's first 30 River miles below NY State's border. This impoundment being the means by which this small Basin's water be conserved to meet lower Basin States' increased future need for it, and permit continued transbasin diversion of the Delaware's water to NYC and Northern NJ. Following this 1961 Compact -- incorporating this 1954 Decree impoundment -- in 1962 Congress authorized Federal construction of this mainstem reservoir, Tocks Island.

(D) 1964-66. Following which there was a Northeast drought, 1964-66. Which confirmed that during its periodic droughts, the small, upper Delaware Basin doesn't have enough water for NYC to divert 800 mgd of it transbasin, and maintain the Delaware's flow at that 1750 cfs minimum required for diversion of another 100 mgd of it to transbasin NJ, and for all lower Basin State people dependent on it during drought.

(E) 1975. Following which, in 1975 three of the four Basin States (excluding Pa.) opposed construction of the Decree-Compact mainstem impoundment, Tocks Island -- on grounds (1) of adverse environmental impacts, (2) it impounds far more water then they need, and (3) there are alternative, smaller, lower Basin State project ways of meeting their lower Basin needs.

(F) 1978. Following which, in 1978 Congress included all 105 miles of the upper Delaware mainstem, from its formation up on the NY-PA border down to Delaware Water Gap, in the National Wild and Scenic (free-flowing) Rivers System.

---

Footnote cont'd from page 1.

> may require that whatever diversion or diversions which may be granted in the proceedings be amended or eliminated" later (Master's Report to the U.S. Supreme Court 1954, pages 26-27). And the Court decreed anew, as in its 1931 Decree here Amended, that no transbasin diversion allowed in 1954 gives any "prior appropriation", or "apportionment", or "any superiority of right" to any of this Basin's water to NYC (Section VIII). And the Court again specially reserved its future jurisdiction to enforce or to issue "any order or direction or modification of this decree" that any Decree Party may later show appropriate (Section X).

(G) 1983. Following which, in 1983 the four Basin States with NYC agreed: ONE, for those droughts, when the Decree and Compact require NYC to maintain a minimum 1,750 cfs flow to the downstream States, areas as precondition to diverting their Basin's water over to NYC, NYC can let that minimum drop to as low as 1,150 cfs, and divert 520 mgd of this Basin's water over to NYC; and NJ can divert another 65 mgd of it to North Jersey.[1] And TWO, lower Basin States' people will finance construction of new reservoir storage sufficient to provide some 600 cfs of flow to meet lower Basin needs during drought, namely: (a) Merrill Creek Reservoir in NJ, by lower Basin power companies to meet water needs for previously-estimated new nuclear power plants, 170 cfs, cost $270 million completed 1986, (b) enlarge Federal Walter Project in Pa., 290 cfs, cost $110 million 1984 prices, completed 1990, (c) enlarge Federal Prompton Project in Pa., 130 cfs, cost $40 million 1983 prices, completed 1995.[2]

(H) 1984. Proposed Merrill Creek Reservoir is sized, 170 cfs, to meet water needs of new nuclear power plants scheduled in 1978 for construction in this Basin thereafter. Since then, many have been cancelled or deferred. Last year, 1984, when DRBC approved this proposed reservoir's construction, it found Merrill Creek will meet water needs of new Basin plants built after year 2000. Needs of existing Basin power plants and those under construction for this proposed 170 cfs reservoir total only about 70 cfs.

---

[1] By the 1954 Decree, 1,750 cfs is minimum mainstem flow NYC must maintain to lower Basin areas dependent on it during drought, to avoid damaging them during drought, i.e. legally before diverting their Basin's water over to NYC during drought. And the Court's 1931, 1954 Decrees specify (page 1 footnote 1 above,) that the transbasin diversions they permit are no "prior appropriation" or "apportionment" of any of this Basin's water to transbasin NYC or NJ, and give them no "superiority of right" to any of it.

[2] The cost of this new storage, to help avoid damage to lower Basin people during drought due to NYC reduction of their mainstem's minimum flow to them during drought, will all be paid by lower Basin State people, only. During the Decree litigation, though, the Supreme Court's 1931 Master reported, pages 22-23: "Counsel for New York expressed the ability and willingness of the City of New York to pay [money] damages to anyone injured" downstream by its diversion of their Basin's water.

(I.) 1985. DRBC says it will prepay the Corps of Engineers to construct new Walter Reservoir storage. To do so, DRBC has to have "reimbursable demand" for its 290 cfs, to pay its $110 million cost,1984 prices. By the Compact, NYC and North Jersey pay DRBC nothing for its reservoir storage needed for Basin people. If DRBC has Basin power companies construct proposed Merrill Creek's 170 cfs of storage, there's no power company "reimbursable demand" for Walter, to help pay its 290 cfs storage cost. Which will be extremely high for any Basin non-power people that may commit to pay it.

* * * * *

## II. BASIN IRRIGATION-AGRICULTURE-LIVESTOCK WATER USE

The Committee is not unfamiliar with the Delaware Basin.

In 1961 the Committee favorably reported (No. 87-1032) what became the law granting Congress' consent to the Federal Government's participation in, and reservations to, the Delaware Basin interstate Compact (PL 87-328). And twenty years ago, September 8, 1965, this Committee held hearings on the "Northeast Water Crisis" then afflicting this Basin.

Which, I regret to say, is what we're here to consider, again this morning.

According to the DRBC's Level B Report, page 16: Irrigation-agriculture and livestock account for one-third of all seasonal (June-September) depletive water uses in this Basin. Today, 1985, they total 282 million gallons a day. By 1990, they'll use still another 44 million gallons a day, rising to 323 mgd!

In that we now know the increased water use that Report projected for electric power for this period will not occur (i.e., 48 mgd, to 156 from 108), irrigation-agriculture-livestock is the largest,fastest-growing segment of all water use in this Basin.

That is one of this Committee's major jurisdictional responsibilities. So this morning we'll be interested in hearing what provisions are underway here,or ought to be,to assure that this increasing irrigation-agriculture-livestock water need is going to be met along with others in these nearby years.

* * * * *

## III. DRBC RESERVOIR REPAYMENT RULE

DRBC's reservoir repayment rule, promulgated 1974 (18 CFR 420), requires only those who started using this Basin's water, or more of it, after its 1961 Compact to pay the cost of its reservoir storage needed to meet needs of all Basin people, including all those now using it who began doing so before that Compact. And DRBC can fine, and prohibit all post-Compact water users who don't pay from using any of their Basin's water (to which they may have "riparian rights" by State law). This is because, DRBC's 1981 Level B Report says (page 24):

> "Section 15.1(b) of the Delaware River Basin Compact provides that the Commission shall not impose any charge for water withdrawals if such withdrawals could lawfully have been made without charge on the [October 1961] effective date of the Compact."

But that 1981 Report says all Basin surface water withdrawals for use in-Basin total 9,640 mgd. And all that began before the Compact -- and can still be withdrawn free of charge today -- total 11,037 mgd, or 1,400 mgd more than total 1981 Basin withdrawal.

So, if we need more storage to serve everyone in the Basin now, and DRBC's rule requires only those who began using water here after that Compact to pay for it, doesn't this mean that they have to pay for 1,400 mgd (2,150 cfs) more free water storage for those using it today who started doing so before the Compact?[1]

* * * * *

---

[1] NOTE: This DRBC rule, for these four "riparian" water right States (i.e., free water for those who started using it first), is akin to Western States' "prior appropriation" water law. Which ranks water users' rights in order of their seniority, whereby those who started using it first can continue to do so over any others whose uses began later. DRBC's rule differs from it, though, in that "prior appropriation" water law never results in junior water users financing new storage to meet senior water users' needs.

## IV. UPPER NY-PA BASIN EXEMPTION

DRBC's reservoir repayment rule exempts all Basin people who use water taken from streams above or tribitary to the Delaware River mainstem's gauging station at Montague -- regardless of when they began using water, before or after the Compact.

This exemption includes all of this mainstem's headwaters, and all New York-Pennsylvania people in what appears to be at least a-third of this whole Basin -- or more than a-third of its area measured above the mainstem's tidewater level at Trenton.

Montague gauging station only serves as the point where the River Master measures the mainstem's flow that the 1954 Decree directs NYC to maintain to the lower Basin during drought. Those upper NY-PA Basin peoples' use of its water has the same effect on its total pooled supply as lower Basin peoples' use of it. Neither the Decree or the Compact contain anything supporting or suggesting this DRBC exemption.

Why does DRBC exempt all those upper Basin people from its rule? Will this exemption similarly apply to repayment of the cost of Walter storage?

## V. LOWER BASIN IRRIGATION EXEMPTION

The Water Supply Act of 1958, by which the Corps makes Basin storage available and DRBC repays its cost, authorizes Federal storage only for "municipal or industrial" water supply.

I notice DRBC's rule, for repayment of the cost of this "municipal or industrial" storage, gives those who use it for "agricultural irrigation" a certain exemption -- namely, one acre-foot of free water for each acre they had under irrigation for the year ending March 1971.

What's the statutory basis for this exemption? How much does this exemption total now, in acre-feet of storage? How much will it total in 1990? Will this exemption similarly apply to repayment of the cost of new Walter storage?

## VI. PAST USERS' EXEMPTION

This Committee favorably reported the law attaching Congress' Reservations to this interstate Compact, including its Section 15.1(b) Reservation. And, as noted, DRBC's Final Level B Report says "Section 15.1(b) of the Delaware River Basin Compact" prohbits DRBC from making any Basin people help pay the cost of its storage, needed now, if they were withdrawing and using Basin water there without charge before the Compact (before the storage they now need to do so was built)!

On examining the Compact, and Congress' Act attaching its Reservations to it, and its legislative history doing so, I'd say Congress would be pretty surprised at DRBC's understanding of this Act of Congress.

On examining it, I see: (A) Section 15.1(b) doesn't prohibit DRBC from charging those in the Basin now who were withdrawing and using its water there before the Compact; but only those who were withdrawing and diverting it "from the Basin" -- as the Compact says NYC and North Jersey were doing without charge under the 1954 Decree that the Compact is not to change. (B) Contrary to DRBC's Report, this Reservation is not part "of the Delaware River Basin Compact". And (C), there's nothing in the Compact that says DRBC won't make those in the Basin who need its storage now help pay for its cost -- regardless of when they started withdrawing and using Basin water there.

Where did DRBC get the idea that this Congressional Reservation to the Compact is part of the Compact? And where in the Compact does DRBC get the idea that it can't make Basin people who started withdrawing the Basin's water before the Compact, help pay for the cost of storage needed for them to continue withdrawing and using it there now?

## VII. NON-DISCRIMINATORY CHARGES

On DRBC's belief that, by law (PL 87-328, Sec. 15.1(b)), Congress prohibits DRBC from making Basin people who started their present use of its water before the Compact pay for storage they need to use it now, DRBC is considering asking Congress to change that law. It is considering doing so because DRBC recognizes that its application of Congress' Act is unworkable; and certain opponents of DRBC's application of it failed to show the court that DRBC's application of it is wrong.

Without examining their arguments that the court rejected, I'm not sure Congress would accept any court ruling rejecting them to mean (A) that Congress' Act requires the application that DRBC makes of it, or (B) that DRBC is not free to apply Congress' Act to mean what it says, on its face.

But apart from that, I understand DRBC would have Congress change its law to say DRBC must charge those whose present use of Basin water began before the Compact, less then DRBC's cost of providing storage needed to serve them now.

Wouldn't that mean that those who've been paying for DRBC storage needed to serve themselves and those free-riders must pay more for the storage they'll use, to cover the cost of storage needed to serve those free-riders that they don't pay?

If post-Compact users have been improperly overcharged by DRBC's unworkable application of Congress' Act, why would Congress change it to say they must be overcharged in the future?

## VIII. BASIN FLOW AUGMENTATION BENEFICIARIES

It appears that much of DRBC's new Walter-Prompton storage would be to provide flow augmentation. At Section 4.3 the Compact authorizes DRBC to do so. And it says that when it does, DRBC can assess its cost of doing so on those measurably benefitted thereby, and that their cost for it can't exceed its actual benefit to them.

Congress generally follows the same policy. It repeatedly rejected propositions saying that beneficiaries of flow augmentation storage need not repay the Federal cost of providing it.

In that flow augmentation is uniquely a storage requirement of this Basin, and its Compact makes special provision for it, what is DRBC's experience in administering Section 4.3.

* * * * *

# TESTIMONY

SUBMITTED
TO
SENATE SUBCOMMITTEE
ON
WATER AND POWER

HONORABLE SENATOR WILLIAM BRADLEY, CHAIRMAN

Arnold Allentuch

Arnold Allentuch
Associate Vice President
for Academic Affairs

July 30, 1985

## EXECUTIVE SUMMARY

Water Research Planning Center for the Nation's Water Supply Needs through Appropriate Financing, Supportive Public Attitudes, and Sound Capitalization and Management of Utilities

### I. BACKGROUND

The Water Research Planning Center was conceived by a Water Resource Management Task Force, convened in the fall of 1983 and composed of representatives from the New Jersey Departments of Treasury and Environmental Protection, the Army Corps of Engineers, the New Jersey Alliance for Action, New Jersey Institute of Technology, private industry, utilities, and water supply systems. The Task Force met over a period of approximately one year; their purpose was to address the water infrastructure finance dilemma.

### II. OBJECTIVES

In order to help assure a continuing, dependable supply of water; to provide a foundation for effective financial management of New Jersey's (and the nation's) water supply systems; and to enable more informed decision-making by managers, operators, rate-making bodies and government officials, the following objectives must be fulfilled:

- quantify the true economic value of water to users.
- establish a basis for determining the actual cost of providing services in order to review current pricing procedures and provide for self-sufficiency among utilities.
- define the basic requirements for implementation of management structures and capital financing plans appropriate for efficient and effective water supply systems of various types and sizes.
- provide for degree-level and continuing professional education for water utility managers.
- measure public attitudes and convey to consumers the practical conclusions reached in each of the project areas, in order to develop supportive attitudes and acceptance of user fees which reflect an appropriate relationship between "cost," "value" and "price."

During the formulation of this proposal, a number of needs were identified by the Task Force:

- Government:
  - Implementation of an affordable infrastructure program.
  - Setting of bond interest rates to promote capital improvements through use of the State Bond Fund

Proceeds already available.
Data to support rate structure analysis.
Sufficient service delivery to promote and maintain health and economic development.

- Users (including residential, industrial and agricultural consumers):
  Assurance of a stable predictable water supply
  Understanding of the need to provide support for proper utility finance and management.

- Utilities:
  Readjustment of rates so that they are not solely based on short-term considerations.
  Restructuring of management to ensure a significant investment in permanent solutions.

## III. RATIONALE

Public perceptions of water resources include:

- Assumption that potable water in adequate quantities will always be available.
- Poor understanding of the adverse health and economic consequences of insufficient water supply.
- Lack of knowledge of actions required to correct existing and potential water supply deficiencies.

New Jersey can serve as a National Model because:

- State includes many examples of water supply problems; representative of those found throughout the nation.
- State includes a variety of land uses, water resources, water delivery systems and smoke-stack and high technology industry - in a geographically small and densely populated area.
- State has begun to invest in solutions.

## IV. WATER RESEARCH PLANNING CENTER AT NJIT

The Task Force recommends the establishment of a Water Research Planning Center at New Jersey Institute of Technology. As a National Demonstration Project, the Center will bring together the professional talents required to address the objectives cited, in cooperation with appropriate governmental and nongovernmental entities. It will obtain and direct the services of the requisite private, public, and academic resources to accomplish the tasks identified. It will serve as a repository of data on water system financial management and as a professional center to address future water supply issues. It will also provide continuing education programs for practicing water supply managers and undergraduate and graduate education for existing and prospective professionals specializing in water resource management.

The largest technological university in the New York metropolitan region, NJIT offers a variety of degree-granting programs related to the technologies, from the baccalaureate to the doctorate, including a master's option in the management of public and regulated enterprises. The Institute's special interests and capabilities include hazardous and toxic substance research (currently designated as both an Advanced Technology Center and an NSF Industry/University Cooperative Research Center); computer and information science research and development (including database development and the management of computer-based information); and water resource management and development. Faculty include Dr. Eugene Golub, Chairman, Department of Civil and Environmental Engineering, and Professors Robert Dresnack and Franklin Salek; together, these three have received well over $1 million in grants relating to water supply systems in New Jersey to conduct assessments, public hearings, and management programs, and to develop training materials for utilities.

MR. CHAIRMAN, I WISH TO THANK YOU FOR PROVIDING ME THIS OPPORTUNITY TO SUBMIT THIS TESTIMONY FOR YOUR CONSIDERATION. I SHALL SPEND MY TIME DESCRIBING TO YOU THE ASPIRATIONS, PLANS, AND ACTIVITIES OF A NEW JERSEY TASK FORCE OF EXPERTS IN WATER RESOURCE MANAGEMENT, TOGETHER WITH THE RELATED ACTIVITIES OF THE FACULTY OF THE NEW JERSEY INSTITUTE OF TECHNOLOGY. BY DOING THIS, I HOPE THAT I WILL BE PROVIDING YOU WITH SOME INSIGHT INTO WHAT MIGHT BE DONE TO ALLEVIATE THE WATER RESOURCE MANAGEMENT PROBLEMS THAT EXIST HERE IN THE NORTHEAST.

CONCERNED ABOUT THE CONTINUING INABILITY OF NEW JERSEY'S MANY WATER SUPPLY SYSTEMS TO PROVIDE A RELIABLE SUPPLY IN TIMES OF DROUGHT, DESPITE PLENTIFUL WATER RESOURCES, A WATER RESOURCE MANAGEMENT TASK FORCE WAS CONVENED IN THE FALL OF 1983 BY REPRESENTATIVES OF THE NEW JERSEY DEPARTMENTS OF TREASURY AND ENVIRONMENTAL PROTECTION, THE ARMY CORPS OF ENGINEERS, THE NEW JERSEY ALLIANCE FOR ACTION, NEW JERSEY INSTITUTE OF TECHNOLOGY, PRIVATE INDUSTRY, UTILITIES, AND WATER SUPPLY SYSTEMS TO ADDRESS THE WATER INFRASTRUCTURE FINANCING DILEMMA. EACH OF THESE SECTORS HAS BEEN INVOLVED IN WATER SUPPLY-RELATED WORK AND IN THE SOLUTION OF ASSOCIATED PROBLEMS. THE TASK FORCE IDENTIFIED FOUR BASIC TASKS:

(1) THE QUANTIFICATION OF THE TRUE ECONOMIC VALUE OF WATER TO USERS;

(2) THE DEFINITION OF THE BASIC REQUIREMENTS FOR IMPLEMENTATION OF MANAGEMENT STRUCTURES AND CAPITAL FINANCING PLANS APPROPRIATE FOR EFFICIENT AND EFFECTIVE WATER

SUPPLY SYSTEMS OF VARIOUS TYPES AND SIZES;

(3) THE ESTABLISHMENT OF A BASIS FOR DETERMINING THE ACTUAL COST OF PROVIDING SERVICE AND ITS RELATIONSHIP TO THE PRICES CURRENTLY BEING CHARGED TO USERS OF VARIOUS CLASSES FOR SUCH SERVICE; AND

(4) THE MEASUREMENT OF PUBLIC ATTITUDES OVER TIME RELATIVE TO THESE TASKS.

THE TASK FORCE RECOMMENDED THE ESTABLISHMENT OF A WATER RESEARCH PLANNING CENTER AT NEW JERSEY INSETITUTE OF TECHNOLOGY. AS A NATIONAL DEMONSTRATION PROJECT, THE CENTER WOULD BRING TOGETHER THE PROFESSIONAL TALENTS REQUIRED TO ADDRESS THE OBJECTIVES CITED, IN COOPERATION WITH APPROPRIATE GOVERNMENTAL AND NONGOVERNMENTAL ENTITIES TO PROVIDE ADEQUATE WATER SUPPLY THROUGH SOUND PRICING, FINANCING, CAPITAL PLANNING, AND UTILITY OPERATIONS MANAGEMENT. THE CENTER WOULD OBTAIN AND DIRECT THE SERVICES OF THE REQUISITE PRIVATE, PUBLIC, AND ACADEMIC RESOURCES TO ACCOMPLISH THE TASKS OF A NATIONAL DEMONSTRATION PROJECT; IT WOULD SERVE AS A REPOSITORY OF DATA ON WATER SYSTEM FINANCIAL MANAGEMENT; IT WOULD SERVE AS A PROFESSIONAL CENTER TO ADDRESS FUTURE WATER SUPPLY ISSUES; AND IT WOULD PROVIDE CONTINUING EDUCATION PROGRAMS FOR PRACTICING WATER SUPPLY MANAGERS, AS WELL AS GRADUATE AND UNDERGRADUATE EDUCATION FOR PROFESSIONALS SPECIALIZING IN WATER RESOURCE MANAGEMENT.

THE TASK FORCE RATIONALE FOR PROPOSING THE WATER RESEARCH PLANNING CENTER AT NEW JERSEY INSTITUTE OF TECHNOLOGY

WAS LARGELY BASED ON THE COLLECTIVE EXPERIENCE OF THE TASK FORCE MEMBERS IN MEETING THE CHALLENGE OF PROVIDING, THROUGH PERIODS OF PLENTY AND PERIODS OF DROUGHT, A CONTINUOUS DEPENDABLE WATER SUPPLY.

ALTHOUGH POTABLE WATER IN ADEQUATE QUANTITIES IS PERHAPS THE SINGLE MOST IMPORTANT COMMODITY IN PROMOTING THE GENERAL HEALTH AND WELL-BEING OF ANY CIVILIZATION, IT IS ALL TOO OFTEN TAKEN FOR GRANTED. BECAUSE WATER SUPPLY IS ONLY PERIODICALLY INSUFFICIENT, RISK TAKING IS OFTEN AN ALTERNATIVE TO INVESTMENT PLANNING AND INFRASTRUCTURE DEVELOPMENT. THUS, DESPITE THE OCCURRENCE OF DROUGHTS APPROXIMATELY EVERY FIFTEEN YEARS IN THE NEW JERSEY/NEW YORK/PENNSYLVANIA REGION SINCE THE BEGINNING OF THIS CENTURY, MANY WATER PURVEYORS HAVE FACED EVERY NEW DROUGHT AS AN UNFORESEEN CRISIS.

CLEARLY, SUCH A BASIC COMMODITY AS POTABLE WATER MUST BE PRICED IN TERMS OF THE RELATIONSHIP BETWEEN THE COSTS TO DEVELOP, MAINTAIN AND UPGRADE WATER SUPPLY SYSTEMS AND THE ECONOMIC AND PUBLIC HEALTH VALUE OF RELIABLE SERVICE TO THE COMMUNITY. THE POSTPONEMENT OF SIGNIFICANT INVESTMENT IN PERMANENT SOLUTIONS INFLATES THE COSTS TO BE BORNE EVENTUALLY BY ALL CONSUMERS - RESIDENTIAL, INDUSTRIAL AND AGRICULTURAL - IN ORDER TO FINANCE THE INFRASTRUCTURE NEEDED TO MAINTAIN SERVICE DURING FUTURE DROUGHTS. MOREOVER, USERS DO NOT GENERALLY PERCEIVE THE ADVERSE HEALTH AND ECONOMIC CONSEQUENCES OF AN INSUFFICIENT POTABLE WATER SUPPLY AS COSTLY TO THEM.

NEW JERSEY IS AN IDEAL FOCUS FOR EXAMINATION OF THESE CRITICAL ISSUES. THE STATE HAS A WIDE RANGE OF SUPPLY PROBLEMS REPRESENTATIVE OF THOSE FOUND ELSEWHERE THROUGHOUT THE NATION. THESE INCLUDE INADEQUATE RAW WATER SUPPLY DEVELOPMENT, DECAYING TREATMENT AND DISTRIBUTION FACILITIES, AND WATER RATES BASED PRIMARILY UPON CURRENT OPERATING COSTS RATHER THAN ON LONG-TERM CAPITAL OPERATING REQUIREMENTS AS WELL. BECAUSE NEW JERSEY IS A GEOGRAPHICALLY SMALL AND DENSELY POPULATED STATE, IT OFFERS A MANAGEABLE CONTEXT FOR RESEARCH WHICH WILL SURELY HAVE NATIONAL APPLICATIONS. NEW JERSEY HAS URBAN, EX-URBAN, AND RURAL AREAS; GROUNDWATER, RESERVOIRS, AND WELLS; SALT-WATER INCURSION AND TOXIC WASTE LEACHING; AND A MULTIPLICITY OF PURVEYORS AND PURVEYOR TYPES. THE SIGNIFICANCE OF THE NEW JERSEY SITUATION WAS, IN FACT, NOTED BY THE CORPS OF ENGINEERS. AT THE DIRECTION OF THE U.S. CONGRESS, THE CORPS STUDIED OUR REGIONAL WATER SUPPLY PROBLEMS IN 1984 AND TESTIFIED THAT THEY ARE SERIOUS, COMPLEX AND INTER-RELATED.

NEW JERSEY INSTITUTE OF TECHNOLOGY, THE LARGEST TECHNOLOGICAL UNIVERSITY IN THE NEW YORK METROPOLITAN REGION, OFFERS A VARIETY OF DEGREE-GRANTING PROGRAMS RELATED TO THE TECHNOLOGIES, FROM THE BACCALAUREATE TO THE DOCTORATE, INCLUDING A MASTER'S OPTION IN THE MANAGEMENT OF PUBLIC AND REGULATED ENTERPRISES.

RESEARCH IS CONDUCTED IN A BROAD RANGE OF TECHNICAL AREAS BY INDIVIDUAL FACULTY MEMBERS. SPECIAL AREAS OF INTERDISCIPLINARY STRENGTH RELATED TO WATER RESOURCE MANAGEMENT INCLUDE:

ENVIRONMENTAL SCIENCE AND ENVIRONMENTAL ENGINEERING RESEARCH WITH A PARTICULAR CONCENTRATION IN HAZARDOUS AND TOXIC SUBSTANCE RESEARCH AND WATER RESOURCE DEVELOPMENT AND UTILIZATION. CENTERS HAVE BEEN DEVELOPED TO FOCUS ON CERTAIN OF THESE RESEARCH AREAS. FOR EXAMPLE, THE INDUSTRY/UNIVERSITY COOPERATIVE CENTER FOR RESEARCH IN HAZARDOUS AND TOXIC SUBSTANCES IS BOTH A NATIONAL SCIENCE FOUNDATION DESIGNATED INDUSTRY/UNIVERSITY COOPERATIVE RESEARCH CENTER AND, COTERMINOUSLY, AN ADVANCED TECHNOLOGY CENTER AS RECOMMENDED BY THE GOVERNOR'S COMMISSION ON SCIENCE AND TECHNOLOGY. ADMINISTERED BY AN INTERINSTITUTIONAL CONSORTIUM LED BY NEW JERSEY INSTITUTE OF TECHNOLOGY, AND ALSO INCLUDING RUTGERS UNIVERSITY, UNIVERSITY OF MEDICINE AND DENTISTRY OF NEW JERSEY, STEVENS INSTITUTE OF TECHNOLOGY AND PRINCETON UNIVERSITY, THE CENTER'S RESEARCH CONCERNS ADDRESS PROBLEMS RELATED TO ENSURING WATER QUALITY, INCLUDING BIOLOGICAL AND CHEMICAL TREATMENT, PHYSICAL TREATMENT, ON-SITE ASSESSMENT OF CONTAMINATION AND REMEDIAL ACTION, AND HEALTH EFFECTS ASSESSMENT. THE WATER RESOURCE MANAGEMENT CENTER AT NEW JERSEY INSTITUTE OF TECHNOLOGY WOULD BENEFIT FROM THE UNIQUE COMBINATION OF EXPERTISE AVAILABLE THROUGH THE HAZARDOUS SUBSTANCE CENTER AND ITS CONSORTIUM PARTNERS.

IN THE AREA OF WATER RESEARCH PLANNING AND DEVELOPMENT, NEW JERSEY INSTITUTE OF TECHNOLOGY RESEARCHERS WITH EXTENSIVE EXPERIENCE IN SERVICE TO THE PUBLIC INCLUDE LEADING INVESTIGATORS IN NUMEROUS STATE-FUNDED RESEARCH PROJECTS TOTALING SEVERAL MILLION DOLLARS IN GRANT SUPPORT. THEY HAVE CONDUCTED

ENVIRONMENTAL ASSESSMENT STUDIES, AND HELD PUBLIC HEARINGS FOR THE RARITAN CONFLUENCE PIPELINE. THE TEAM HAS DIRECTED A FOUR-YEAR ASSESSMENT AND STUDY OF SAFE YIELD OF THE RARITAN CONFLUENCE RESERVOIR, INCLUDING A SYSTEM ANALYSIS OF THE RARITAN RIVER BASIN WATER SUPPLY. THEY HAVE DEVELOPED A SIMULATION MODEL OF THE PASSIC RIVER BASIN WATER SUPPLY SYSTEM TO DETERMINE SAFE YIELD, WORKING WITH SIX MAJOR PURVEYORS AND ESTABLISHING A 60-YEAR DATABASE OF DAILY FLOW AND VOLUME DIVERSION FOR THE RARITAN, PASSAIC, AND HACKENSACK RIVERS.

CURRENT PROJECTS INCLUDE A MANAGEMENT PROGRAM FOR THE PASSAIC RIVER BASIN, WORKING WITH SIX MAJOR PURVEYORS WITH THE OBJECTIVES OF INCREASING OVERALL SAFE YIELD BY 6 PERCENT WHILE DECREASING OPERATIONAL COSTS. IN THE AREA OF FLOOD CONTROL, THESE INVESTIGATORS ARE ORGANIZING A NATIONAL SEMINAR TO STUDY LAND DEVELOPMENT AND THE IMPACT OF STATE REGULATIONS ON FUTURE FLOODING PROBLEMS. THEY HAVE RECENTLY CONDUCTED SEMINARS FOR NEW JERSEY'S COUNTY AND MUNICIPAL ENGINEERS TO FACILITATE COMPLIANCE WITH REGULATIONS.

THE PROPOSED WATER RESOURCE MANAGEMENT CENTER WOULD INITIALLY ENGAGE IN FIVE PROJECTS DESIGNED TO ASSIST PROFESSIONALS IN ADDRESSING BASIC WATER SUPPLY ISSUES AND TO EDUCATE THE PUBLIC ON THE PROBLEMS INVOLVED AND THEIR SOLUTIONS. THESE PROJECTS WOULD REQUIRE THE COLLECTION, ANALYSIS, AND DISSEMINATION OF DATA ON THE MANAGEMENT, REGULATORY, AND POLITICAL ENVIRONMENTS IN WHICH WATER SUPPLY POLICY DECISIONS ARE MADE. THE FIRST STEP WOULD BE, THEREFORE, TO ESTABLISH A DATABASE

INCORPORATING INFORMATION FROM PAST WATER CRISES, CURRENT MANAGEMENT STRUCTURES, AND CAPITAL PLANNING PROCESSES OF EXISTING WATER SUPPLY SYSTEMS. DATA ON THE ACTUAL PRICES CHARGED AND COSTS INCURRED FOR PROVIDING WATER SERVICE THROUGHOUT NEW JERSEY WOULD BE COLLECTED. IN ADDITION, THE REGULATORY ENVIRONMENT WOULD BE EXAMINED. THE FINDINGS WOULD BE WIDELY DISSEMINATED AND THE DATABASE WOULD BE CONTINUALLY UPDATED AND EXPANDED AS APPROPRIATE.

IT IS ANTICIPATED THAT THE WORK CONDUCTED AT THE WATER RESEARCH PLANNING CENTER WOULD BE OF INESTIMABLE VALUE IN THE IMPLEMENTATION OF REALISTIC AND APPROPRIATE CAPITAL FINANCING PLANS FOR WATER SUPPLY FACILITIES THROUGHOUT THE STATE. IT WOULD ALSO FACILITATE MORE EFFECTIVE DECISION-MAKING BY MANAGERS, OPERATORS, RATE-MAKING BODIES, AND GOVERNMENT OFFICIALS RELATIVE TO CAPITAL PRIORITIES, INCLUDING, BUT NOT LIMITED TO, THE PRICING OF LOANS FROM STATE TO LOCAL GOVERNMENT PURVEYORS. FINALLY, THE CENTER WOULD ASSIST STATE GOVERNMENT IN DEVELOPING A BROAD PUBLIC POLICY BASE FROM WHICH STATE AND LOCAL DECISIONS COULD BE MADE RELATIVE TO WATER SYSTEM CAPITAL PLANNING AND FINANCING.

MR. CHAIRMAN, I LEAVE WITH THE SUBCOMMITTEE A COPY OF MY TESTIMONY AND A COPY OF THE PROPOSAL DEVELOPED BY THE WATER RESOURCE MANAGEMENT TASK FORCE TO CREATE AT NEW JERSEY INSTITUTE OF TECHNOLOGY A WATER RESEARCH PLANNING CENTER AS A NATIONAL DEMONSTRATION PROJECT. I THANK YOU AGAIN FOR AFFORDING ME THE PRIVILEGE OF SUBMITTING THIS TESTIMONY TO YOU.

# WATER RESEARCH PLANNING CENTER
# PROVIDING FOR THE NATION'S
# WATER SUPPLY NEEDS
# through
# APPROPRIATE FINANCING, SUPPORTIVE PUBLIC ATTITUDES
# and
# SOUND CAPITALIZATION AND MANAGEMENT OF UTILITIES

New Jersey Institute of Technology

July 30, 1985

## TABLE OF CONTENTS

EXECUTIVE SUMMARY ........ i

I. BACKGROUND ........ 1

II. OBJECTIVES ........ 2

III. RATIONALE ........ 2

IV. WATER RESEARCH PLANNING CENTER AT NEW JERSEY INSTITUTE OF TECHNOLOGY ........ 4

V. PROJECT DESCRIPTION ........ 6

VI. BUDGET ........ 10

July 30, 1985

## EXECUTIVE SUMMARY

### Water Research Planning Center for the Nation's Water Supply Needs through Appropriate Financing, Supportive Public Attitudes, and Sound Capitalization and Management of Utilities

### I. BACKGROUND

The Water Research Planning Center proposed was conceived by a Water Resource Management Task Force, convened in the fall of 1983 and composed of representatives from the New Jersey Departments of Treasury and Environmental Protection, the Army Corps of Engineers, the New Jersey Alliance for Action, New Jersey Institute of Technology, private industry, utilities, and water supply systems. The Task Force met over a period of approximately one year; their purpose was to address the water infrastructure finance dilemma.

### II. OBJECTIVES

In order to help assure a continuing, dependable supply of water; to provide a foundation for effective financial management of New Jersey's (and the nation's) water supply systems; and to enable more informed decision-making by managers, operators, rate-making bodies and government officials, the following objectives must be fulfilled:

- quantify the true economic value of water to users (PROJECT I)
- establish a basis for determining the actual cost of providing services in order to review current pricing procedures and provide for self-sufficiency among utilities (PROJECT II)
- define the basic requirements for implementation of management structures and capital financing plans appropriate for efficient and effective water supply systems of various types and sizes (PROJECT III)
- provide for degree-level and continuing professional education for water utility managers (PROJECT III A)
- measure public attitudes and convey to consumers the practical conclusions reached in each of the project areas, in order to develop supportive attitudes and acceptance of user fees which reflect an appropriate relationship between "cost," "value" and "price." (PROJECT IV)

During the formulation of this proposal, a number of needs were identified by the Task Force:

- Government:
  - Implementation of an affordable infrastructure program
  - Setting of bond interest rates to promote capital improvements through use of the State Bond Fund Proceeds already available
  - Data to support rate structure analysis
  - Sufficient service delivery to promote and maintain health and economic development
- Users (including residential, industrial and agricultural consumers):
  - Assurance of a stable predictable water supply
  - Understanding of the need to provide support for proper utility finance and management

- Utilities:
  - Readjustment of rates so that they are not solely based on short term considerations
  - Restructuring of management to ensure a significant investment in permanent solutions

## III. RATIONALE

Public perceptions of water resources include:

- Assumption that potable water in adequate quantities will always be available.
- Poor understanding of the adverse health and economic consequences of insufficient water supply.
- Lack of knowledge of actions required to correct existing and potential water supply deficiencies.

New Jersey can serve as a National Model because:

- State includes many examples of water supply problems, representative of those found throughout the nation.
- State includes a variety of land uses, water sources, water delivery systems and smoke-stack and high technology industry — in a geographically small and densely populated area.
- State has begun to invest in solutions.

## IV. WATER RESEARCH PLANNING CENTER AT NJIT

The Task Force recommends the establishment of a Water Research Planning Center at New Jersey Institute of Technology. The Center will bring together the professional talents required to address the objectives cited, in cooperation with appropriate governmental and nongovernmental entities. It will obtain and direct the services of the requisite private, public, and academic resources to accomplish the tasks identified. It will serve as a repository of data on water system financial management and as a professional center to address future water supply issues. It will also provide continuing education programs for practicing water supply managers and undergraduate and graduate education for existing and prospective professionals specializing in water resource management.

## V. PROJECT DESCRIPTION

Quantify the real economic value of water to users (PROJECT I)

- Case studies of crisis situations
- Projection of economic consequences of water supply failures
- Development of related database

Determine the real cost of service (PROJECT II)

- Information gathering on current and anticipated costs of developing, managing and financing water supply systems - Database development
- Conduct of demonstration projects for up to six purveyors
- Development of manual on infrastructure assessment

Define effective management structures and capital financing plans for water supply facilities (PROJECT III A)

- Information gathering on existing structures
- Development of guidelines
- Preparation of information materials
- Provision of continuing education and degree-level courses for water supply management professionals using above materials

Provide assistance in the development of regulatory policies and programs to promote implementation (PROJECT III B)

- Information gathering on existing policies and programs
- Assessment of their effect
- Drafting of model laws and regulations in cooperation with the appropriate governmental agencies

Implement a public education campaign in cooperation with other organizations and agencies working on related initiatives (PROJECT IV)

- Strategic opinion research
- Testing of communication strategies
- Implementation of cooperative public information program

## VI. BUDGET

A planning budget has been developed for each of the Projects, as well as an initial start-up period. It is expected that $3.285 million will be spent over a 3 1/2 year span.

## I. BACKGROUND

The Project may be traced directly to a Water Resource Management Task Force, convened in the fall of 1983 by representatives of the New Jersey Departments of Treasury and Environmental Protection, the Army Corps of Engineers, the New Jersey Alliance for Action, New Jersey Institute of Technology, private industry, utilities, and water supply systems to address the water infrastructure financing dilemma. Each of these sectors is involved in water supply-related work and in the solution of associated problems.

Government: Two general problems exist: the difficulty of implementing an infrastructure program that is affordable and the need to set terms of loans from State funds while promoting capital improvements.

Users (including industrial, residential and agricultural consumers): Industry requires a stable predictable water supply. In fact, water cost is usually a secondary consideration relative to its availability. Because water supply problems generally occur only during infrequent emergencies such as drought or system failure, users are not always ready to provide immediate financial support for long range utility finance and management. A realistic determination of the cost of water will help to solve this problem and may also become a basis for establishing rates for other utility services.

Utilities: Many public and private utilities have been faced with both rate- and management-related problems. The former have been caused, in part, by utility governing boards or regulatory agencies, which tend to base rates upon short range considerations rather than upon the long term financial and physical needs of the utility. The latter are the result of inadequate data and education available to water supply professionals. And both have been influenced by public assumptions that water supply problems do not exist.

The common theme underlying these problems is the discrepancy between the price or user fee charged for water and the actual cost of water delivery to the users. The ultimate goal of this Project is true self-sufficiency of New Jersey water utilities, which would provide reasonable service for reasonable rates and also serve as a model for utilities across the United States.

Water supply systems in New Jersey and throughout the nation are comprised of multiple purveyors, employing a variety of methods for determining water user fees. Water supply systems range from individually owned wells, to municipal systems, authorities, and investor-owned utilities of various sizes. The methods of charging for water are equally varied. A goal of the Task Force is, therefore, to create a mechanism by which data on such systems and methods could be analyzed in order to develop an effective methodology for implementing affordable user fees to reflect the necessary costs of maintaining, improving and providing for reliable water service.

## II. OBJECTIVES

The completion of four tasks will provide a more secure foundation for realistic financial management of water supply systems: (1) quantification of the true economic value of water to users; (2) definition of the basic requirements for implementation of management structures and capital financing plans appropriate for efficient and effective water supply systems of various types and sizes; (3) establishment of a basis for determining the actual cost of providing service and its relationship to the prices currently being charged to users of various classes for such service; and (4) measurement of public attitudes over time relative to the foregoing.

To undertake these tasks on a continuing basis, a Water Research Planning Center will be established at New Jersey Institute of Technology. The Center will bring together the professional talents required to address the issues identified, i.e. to provide adequate water supply through sound pricing, financing, capital planning, and utility operations management. The Center will obtain and direct the services of the requisite private, public, and academic resources to accomplish the Project tasks; it will serve as a repository of data on water system financial management; it will serve as a professional center to address future water supply issues; and it will provide continuing education programs for practicing water supply managers, as well as graduate and undergraduate education for professionals specializing in water resource management.

## III. RATIONALE

Although potable water in adequate quantities is perhaps the single most important commodity in promoting the general health and well-being of any civilization, it is all too often taken for granted. In most highly developed nations in the world, in fact, funding for capital improvements to enhance the reliability of supplies is inadequate. Because water supply is only periodically insufficient, risk taking is often an alternative to investment planning and infrastructure development. Thus, despite the occurrence of droughts approximately every fifteen years in the New Jersey/New York/Pennsylvania region since the beginning of this century, many water purveyors have faced every new drought as an unforeseen crisis.

Clearly, such a basic commodity as potable water must be priced in terms of the relationship between the costs to develop, maintain and upgrade water supply systems and the economic and public health value of reliable service to the community. The postponement of significant investment in permanent solutions inflates the costs to be borne eventually by all consumers—residential, industrial and agricultural—in order to finance the infrastructure needed to maintain service during future droughts. Moreover, users do not generally perceive the adverse health and economic consequences of an insufficient potable water supply as costly to them.

There is a growing national awareness of infrastructure decay. Bridge collapses, sewer failures and water main breaks give ample evidence of the critical nature of this problem. Our nation's water supply systems have also suffered from this lack of attention to maintenance, systematic rehabilitation and replacement, and other capital improvements necessary to provide continuing reliable and effective water supplies. The causes of this neglect are many. In addition to diagnosing the sources of the problem, there is a compelling need to help both the professionals in the field and the general public understand specifically what actions will be required to correct existing water supply deficiencies. More effective management and provision for orderly and realistic financing and system repair, maintainence, and operation are necessary to achieve that goal.

New Jersey is an ideal focus for examination of these critical issues. The State has a wide range of supply problems representative of those found elsewhere throughout the nation. These include inadequate raw water supply development, decaying treatment and distribution facilities, and water rates based primarily upon current operating costs rather than on long term capital operating requirements as well. Because New Jersey is a geographically small and densely populated state, it offers a manageable context for research which will surely have national applications. New Jersey has urban, ex-urban, and rural areas; groundwater, reservoirs, and wells; salt-water incursion and toxic waste leaching; and a multiplicity of purveyors and purveyor types. The significance of the New Jersey situation was, in fact, noted by the Corps of Engineers. At the direction of the U.S. Congress, the Corps studied our regional water supply problems in 1984 and testified that they are serious, complex and inter-related.

New Jersey has been working actively to solve these problems. After the drought of 1980-81, the State accelerated its efforts to address the deficiencies in its water supply system. Initiatives have included programs to 1) develop new water supplies through the construction of reservoirs, 2) construct new diversion facilities, 3) make appropriate use of the State's groundwater, and 4) finance system rehabilitation and interconnection. In addition, new water supply management laws and regulations have been or are about to be put into place throughout the State. Funding of $350 million was authorized through the Water Supply Bond Act of 1981 to finance these programs. These actions have propelled New Jersey to the forefront of water management in this country.

In a recent survey, 34 national water experts were asked to rank the most pressing problems in the United States water business today. Among the responses were inadequate rates (rank 3), limited capital funding (rank 4), and unsatisfactory operation and maintenance of small water systems (rank 2). Other national problems identified include the inability to raise rates, political constraints, the need to convince the public to proceed without federal or state assistance, and the diversion of water revenues to non-water users. Each of these problems is present to varying degrees in New Jersey. Because the State is thus a microcosm of the nation's water supply problems and has already begun to invest in solutions, it is in an exellent position to implement the proposed Demonstration Project.

## IV. WATER RESEARCH PLANNING CENTER AT THE NEW JERSEY INSTITUTE OF TECHNOLOGY

New Jersey Institute of Technology is the largest technological university in the New York metropolitan area and one of the largest on the eastern seaboard. Founded in 1881 to provide technological education in support of the region's industrial economy, the Institute continues its historic role as a leader in technical and scientific education. It is a repository of expertise for national, state, and local government.

Baccalaureate degrees are offered in electrical, mechanical, chemical, civil and environmental, and industrial engineering, industrial administration, the sciences, architecture, computer and information science, and actuarial science. There are fifteen master's level programs, including the engineering disciplines, architecture, biomedical engineering, applied mathematics, environmental engineering/science with a toxicology option, computer and information science, and management—including an option in the management of public and regulated enterprises. A Doctor of Engineering Science is offered in the engineering disciplines and a Ph.D. in management is offered jointly with Rutgers-Newark. A Ph.D. in computer science as well as degrees in manufacturing engineering are currently under review by the Department of Higher Education. There are over 7,000 students enrolled in degree programs at the university, approximately 5,000 of whom are undergraduates. Another 4,000 are enrolled in non-degree programs ranging from pre-collegiate to continuing professional education.

Research at NJIT not only serves to advance knowledge in the technologies, but is a vital component in the education of men and women who will play leading roles in advancing the American economy and assuring the nation's health and security. For the fiscal year which ended June 30, 1984, expenditures for research and development at NJIT totaled approximately $4.4 million, with support coming from federal, state, and local governments, corporations, and foundations.

Research is conducted in a broad range of technical areas by individual faculty members. Special areas of interdisciplinary strength include: hazardous and toxic substance research; computer integrated manufacturing; biomedical engineering; microelectronics; surface modification technology; water resource development and utilization; building materials; CAD/CAM; robotics; and telematics. Centers have been or are being developed to focus on certain of these research areas. For example, the Center for Hazardous Substance Management is both a National Science Foundation designated Industry/University Cooperative Research Center and, coterminously, an Advanced Technology Center as recommended by the Governor's Commission on Science and Technology. Administered by an interinstitutional consortium led by NJIT and also including Rutgers University, University of Medicine and Dentistry of New Jersey, Stevens Institute of Technology and Princeton University, the Center's research concerns address problems related to ensuring water quality, including biological and chemical treatment, physical treatment, on-site assessment of contamination and remedial action, and health effects assessment. The Water Research Planning Center at NJIT would benefit from the unique combination of expertise available through the hazardous substance center and its consortium partners.

NJIT's Center for Information Age Technology (CIAT) was designated as a state-wide resource by Governor Thomas H. Kean in 1981. It serves industry, government and academe in the design of computer applications to improve productivity and organizational management. CIAT and other research and development centers at NJIT are served by several computer systems, including a Univac 90/80-4, two DEC VAX 11/780's, five DEC VAX 11/750's, and a CYBER 830 System, as well as DEC and Perkin-Elmer minicomputers. NJIT also has access to the New Jersey Educational Computer Network which operates an IBM 370/168 with VM/CMS and an IBM 3033 with MVS/SP. Access to the computing facility is available from terminal centers located at various sites on campus, as well as through telephone lines from off campus. Other computer equipment includes more than 150 DEC Rainbow microcomputers, 25 DEC PRO 325 microcomputers, and 50 Monroe microcomputers. In addition, a computerized conferencing system, the Electronic Information Exchange System (EIES), with 2000 users worldwide, is operated by NJIT's Computerized Conferencing and Communications Center utilizing a separate computer facility.

NJIT is working with the community colleges in Northern and Southern New Jersey to offer educational programs at all levels (two year through doctoral program) and conduct basic and applied research in various areas of computeer-based manufacturing and related technologies. The North/Central Jersey Regional CIM Center will be housed at NJIT, which will include an advanced manufacturing laboratory, computer design facilities, classrooms and offices. The Center will complement and support a growing array of educational and research programs at NJIT. In addition, the New Jersey Department of Higher Education has funded a CIM/Grahpics Software Center at NJIT which will evaluate and disseminate information on available software, maintain a software library, and provide training for faculty and industry professionals. Finally, NJIT is the site of a Remote Access Center for the National Science Foundation supported John von Neumann Supercomputer Center in Princeton, New Jersey. The Remote Access Center, funded by the New Jersey Commission on Science and Technology, will provide, via high speed lines, a concentration point for data and program transmission to the von

Neumann Center. Stevens Institute of Technology and the University of Medicine and Dentistry of New Jersey are participating with NJIT in the management of the Remote Access Center.

In the area of water resource management and development, NJIT researchers with extensive experience in service to the public include Dr. Eugene Golub, chairman of the Department of Civil and Environmental Engineering, and Drs. Robert Dresnack and Franklin Salek, full professors in the same department. Drs. Golub, Dresnack, and Salek have been the leading investigators in numerous state-funded research projects totaling well over $1 million in grant support. They conducted environmental assessment studies, holding public hearings for the Raritan Confluence pipeline. The team directed a four-year assessment and study of safe yield of the Raritan Confluence Reservoir, including a system analysis of the Raritan River Basin Water Supply. They developed a simulation model of the Passaic River Basin Water Supply System to determine safe yield, working with six major purveyors and establishing a 60-year database of daily flow and volume diversion for the Raritan, Passaic, and Hackensack Rivers. These projects were conducted for the New Jersey Department of Environmental Protection (NJDEP).

Dr. Golub and his associates previously were involved in the Pequannock Watershed Study, conducted by his department for the City of Newark and funded by the New Jersey Department of Community Affairs. They also developed a flood plain manual for NJDEP, which explains procedures for submission of stream encroachment applications. They have recently been engaged by the State's Water Supply Authority to develop standard operational procedures for obtaining optimum yield at minimal cost.

Current projects include a management program for the Passaic River Basin, working with six major purveyors with the objectives of increasing overall safe yield by 6 percent while decreasing operational costs. In the area of flood control, Dr. Golub and his associates are organizing a national seminar to study land development and the impact of state regulations on future flooding problems. They have recently conducted seminars for New Jersey's county and municipal engineers on behalf of NJDEP to facilitate compliance with regulations.

## V. PROJECT DESCRIPTION

Efforts to assist professionals in addressing basic water supply issues and to educate the public on the problems and solutions require the collection, analysis, and dissemination of data on the management, regulatory, and political environments in which water supply policy decisions are made. The first step in this project will, therefore, be to establish a database incorporating information from past water crises, current management structures, and capital planning processes of existing water supply systems. Data on the actual prices charged and costs incurred for providing water service throughout New Jersey will be collected. In addition, the regulatory environment will be examined. This research effort is estimated to require two years. The findings will be widely disseminated and the database will be continually updated and expanded as appropriate.

Professional organizations such as the American Water Works Association, public authorities such as the New Jersey Water Supply Authority and Port Authority of New York and New Jersey, and rate-setting bodies such as the Board of Public Utilities in New Jersey are expected to participate with interested water purveyors in helping to identify existing data and data sources. These bodies will also help set research priorities and refine the goals of the proposed Center.

It is anticipated that the work conducted at the Water Research Planning Center will be of inestimable value in the implementation of realistic and appropriate capital financing plans for water supply facilities throughout the State. It will also facilitate more effective decision-making by managers, operators, rate-making bodies, and government officials relative to capital priorities, including, but not limited to, the pricing of loans from State to local government purveyors. Finally, the Center will assist State government in developing a broad public policy base from which State and local decisions can be made relative to water system capital planning and financing.

**Project Tasks**

I. Quantify the economic value of water to users

1. The case study method will be used to analyze the ability to conduct industrial and commercial activities during droughts or other water emergencies and to determine the cost to industry employees and government when water supply systems are unable to cope adequately with periods of stress. Examples will be drawn from local, national and international experiences.
2. The data will be used to project future crises and to estimate the economic development consequences of failures in utility operations.

II. Determine the real cost and current prices of service.

1. Data will be collected from water purveyors on the current and anticipated costs of managing and financing water supply systems. Such information will include, but not be limited to, costs of development, operation, maintenance, replacement, renewal, expansion, financing, and reserves, as well as the basis upon which these costs are

determined. In addition, various user charges and the methods by which they are established will be incorporated into the database.

2. These data will be available to water supply managers responsible for developing financing plans and justifications for rates to support those plans.

III. A. Define the requirements for implementation of effective management structures and capital financing plans for water supply facilities.

1. Information will be gathered on various sized water supply system management structures, capital planning processes, and rate-setting methodologies. Research conducted by professional water management organizations such as the American Water Works Association, the National Association of Regulatory and Utility Commissioners, and the National Association of Water Companies may serve as valuable resources.
2. Based on the data collected, guidelines will be prepared for water management professionals in the public, private, and non-profit sectors. The guidelines will cover the establishment of short and long-term capital planning goals, including prioritization of the system's needs; effective financial planning and development of rate proposals to support a capital program; and techniques for review and update of the program. Presentations of this information will be prepared for water supply management professionals.
3. Written information, including text and computer-aided training materials and reference manuals, will be prepared and distributed. These will serve as the basis for augmenting the education of water supply professionals at three levels—training by the utility, continuing education programs and graduate degree programs.

III. B. Provide assistance in the development of regulatory policies and programs to assure implementation of the above.

1. Analyses of New Jersey's Board of Public Utilities and other State rate-setting bodies will be undertaken to determine their effectiveness in providing a basis for adequate water supply.
2. As needed, laws and regulations will be drafted in cooperation with the appropriate governmental agencies.

IV. Strategic opinion research

Founded upon public opinion research, a public education campaign would be developed in cooperation with other organizations and agenices working on related initiatives. The purpose of the research would be to:

1. Gauge the nature and extent of the public's current knowledge of and attitudes relative to the water problems faced by New Jersey.
2. Measure the extent to which the public is concerned about these problems.
3. Test different communications strategies for their effectiveness in convincing the public that the problem is serious and needs prompt action.
4. Determine the public's willingness to pay—and how much it is willing to commit—for the range of solutions that may be generated by the Project.

With this research in hand, it will be possible to design an education program of maximal effectiveness.

This program should be delivered to water consumers in a variety of forums judged effective, e.g. television, radio and print media. In view of the nature of this subject, it should be possible to make efficient use of a judicious combination of news coverage (generated by an appropriate communications program) and public service announcements (PSA's). It should be noted, though, that while there is no cost for the placement of PSA's, production costs are comparable with those of paid advertising.

In addition to the program directed at the general public, a complementary program directed at schools would also be valuable in view of the long-term implications of the water problems. It will also be necessary to focus specific attention on large industrial and commercial water users.

The final element of the program should be a major effort to build a coalition of interests acting together to deliver an education program. The more diverse this coalition, the more influential it will be with the news media, the public and other target audiences. The greatest credibility for the education campaign would derive from the public perception that business, industry, environmentalists, consumer advocates, government officials, news media, educators, and scientists support the proposed solutions.

If well-conceived messages are delivered to appropriate audiences by effective spokesmen using optimal communications media, then success of the educational campaign should be assured. And a successful educational campaign will, in turn, greatly facilitate successful implementation of the program proposed by the Project.

## VI. BUDGET

### PROJECT TASK: I

**Title:** Quantify the real economic value of water to users.
**Expertise:** Urban Planning, Economics, Social Sciences, Engineering.
**Project Description:** See Page 7
**Products Envisioned and Schedule:**

| | |
|---|---|
| Year 1 | An economic input - output model |
| Years 2 and 3 | Case Studies in New Jersey and the nation and establishment of database. |

**Budget Estimate:**

| | |
|---|---|
| Year 1 | $70,000 |
| Year 2 | $150,000 |
| Year 3 | $170,000 |
| **Total Budget** | **$390,000** |

### PROJECT TASK: II

**Title:** Determine the real cost of service.
**Expertise Required:** Engineering, Engineering Economics, Accounting, Finance.
**Project Description:** See Page 7
**Products Envisioned and Schedule:**

| | |
|---|---|
| Year 1 | Database development |
| Year 2 and 3 | Specific demonstration projects for up to six purveyors. |
| Year 3 | Manual on infrastructure assessment. |

**Budget Estimate**
$125,000 per year for three years, or $375,000

### PROJECT TASK: III.A

**Title:** Define requirements for implementation of effective structure and capital financing plans for water supply facilities.
**Expertise Required:** Engineering, Finance, Accounting
**Project Description:** See Page 8.
**Products Envisioned and Scheduling:**

| | |
|---|---|
| Year 1 | Manual* to be utilized by utilities. |
| Year 2 | Manual* to be used for continuing education courses |
| Year 3 | Manual* (textbook) to be used for graduate program. |

* Text and computer-aided training materials and reference manuals. Includes production.

**Budget Estimate:**

| | |
|---|---|
| Year 1 | $100,000 (Manual) |
| Year 2 | $40,000 (Manual) + $20,000 (Manual update) |
| Year 3 | $50,000 (Manual) + $20,000 (Manual update) |
| **Total For Task** | **$190,000** |

### PROJECT TASK: III.B

**Title:** Provide assistance in the development of regulatory policies and program to assure implementation of III.A.

**Expertise Required:** Legal, Public Adminstration, Government, Engineering, Social Science, Finance, Accounting.

**Project Description:** See Page 8.

**Products Envisioned and Scheduling:**

Years 2 and 3: Models for tariffs and laws, draft regulations, draft policy papers, educational articles.

**Budget Estimate:**

| | |
|---|---|
| Year 2 | $50,000 |
| Year 3 | $60,000 |
| **Total For Task** | **$110,000** |

### PROJECT TASK: IV

**Title:** Implement a public education campaign in cooperation with other organizations and agencies working on related initiatives.

**Expertise Required:** Public Relations, Communication and Media Skills, Engineering.

**Project Description:** See Pages 8 and 9.

**Products Envisioned and Schedule:**

| | |
|---|---|
| Year 1 | Communications |
| Year 2 and 3 | Newsletter, TV/radio/media ads, Speakers Bureau. |

**Budget Estimate:**

| | |
|---|---|
| Year 1 | $65,000 |
| Year 2 | $110,000 |
| Year 3 | $135,000 |
| **Total Budget =** | $310,000 |

### START-UP BUDGET - SIX MONTHS

A start-up budget is proposed to provide for the identification and development of resources including initial funding, a search for permanent funding, and the creation of a permanent Board. An Acting Executive Director will be selected, with responsibility for communicating with the Steering Committee and for preparatory activities related to certain projects. For example, the Acting Executive Director will take the initial steps to engage a consultant to conduct public attitude research (Project IV) and will engage in information gathering related to water supply systems (Project IIIA) and regulatory policies (Project IIIB).

# WATER RESEARCH PLANNING CENTER
# PROJECT BUDGET SUMMARY
# and
# MANAGEMENT BUDGET
# ($000)

| | Start | | Year | | |
|---|---|---|---|---|---|
| | Up | 1 | 2 | 3 | Total |
| **PROJECTS** | | | | | |
| Project I | | | | | |
| Director Salary and Fringe (1) | $ - | $ 40 | $ 40 | $ 40 | $120 |
| Other Project I Expenses | - | 70 | 150 | 170 | 390 |
| Project II | | | | | |
| Director Salary and Fringe (1) | - | 40 | 40 | 40 | 120 |
| Other Project II Expenses | - | 125 | 125 | 125 | 375 |
| Project III | | | | | |
| Director Salary and Fringe (1) | - | 40 | 40 | 40 | 120 |
| Other Project IIIA Expenses | - | 100 | 60 | 70 | 230 |
| Other Project IIIB Expenses | - | - | 50 | 60 | 110 |
| Project IV | | | | | |
| Director Salary and Fringe (1) | - | 40 | 40 | 40 | 120 |
| Other Project IV Expenses | - | 65 | 110 | 135 | 310 |
| **Total Projects** | 0 | 520 | 655 | 720 | 1,895 |
| **MANAGEMENT** | | | | | |
| Salaries | | | | | |
| Executive Director | 30 | 60 | 60 | 60 | 210 |
| Director, Data Management (1) | - | 40 | 40 | 40 | 120 |
| Director, Education (1) | - | - | 40 | 40 | 80 |
| Adminstrative Assistant | 10 | 20 | 20 | 20 | 70 |
| Fringe Benefits (25%) | 10 | 30 | 40 | 40 | 120 |
| Total Personnel | 50 | 150 | 200 | 200 | 600 |
| Other Than Personnel (2) | 50 | 90 | 110 | 110 | 360 |
| **Total Management** | 100 | 240 | 310 | 310 | 960 |
| **Total** | $100 | $760 | $965 | $1,030 | $2,855 |

(1) Director Salary and Fringe Calculations
Faculty Academic Year Salary = $40,000

| Charge To Project | |
|---|---|
| 50% for Academic Year (Half Time) | $20,000 |
| 30% for Summer (Full-Time) | 12,000 |
| 25% for Fringe Benefits | 8,000 |
| | $40,000 |

(2) Approximately 10% of Project and Management Expenses, Except Start-up

THE PENJERDEL COUNCIL
JAMES P. MACLEAN, III
CHAIRMAN

August 7, 1985

Senator William Bradley
c/o William B. Conway, Jr.
Counsel
Committee on Energy and
Natural Resources
Cherry Hill Inn
Cherry Hill, NJ

Dear Senator Bradley:

We have been advised that you or your office is today conducting a hearing at the Cherry Hill Inn in connection with water resources in New Jersey and, more generally, in the Delaware River Basin.

While the PENJERDEL Council will not have anyone present to testify this morning, you, of course, are aware of our strong interest in the subject and of various of the positions which we have taken concerning it.

Dennis Marco of your staff attended the PENJERDEL Regional Affairs Conference on July 25th of this year and is aware that the PENJERDEL Council and its members in business, industry and professions in the tri-state area regard water resource management as one of the most serious and pressing issues effecting the long-range economic growth of our area.

Water is one of the most significant and unique resources in the PENJERDEL region. We have the potential for a virtually unlimited supply of quality water for individual and industrial use. We do not have adequate means for ensuring the long-term constant availability of water through reservoirs and appropriate distribution systems. The region cannot afford continued and increasingly interruption of adequate water supply due to drought conditions.

Suite 800 Avenue of the Arts Building Philadelphia, Pennsylvania 19107 215-545-1234

It is vital that the Delaware River Basin provide facilities which will permit water supply adequate to current and future projected needs. Of particular importance is the necessity of protecting Southern New Jersey wells from salt water intrusion.

PENJERDEL believes that the keys to adequate water supply include immediate completion of facilities agreed upon in the "Good Faith Agreement" and long-term provision for major reservoir facilities such as Tocks Island.

With regard to service charges, PENJERDEL recognizes that equitable service charges will be required in order to finance facilities needed to maintain our water supply. Such charges should apply only to an appropriate proportion of the total facilities being modified or constructed bearing in mind the need for flood control, recreation, etc. PENJERDEL does not believe that charges should be imposed to pay for past construction of facilities.

Enclosed are the following position papers which, together with this letter, we request to be placed into the record of your hearing today:

Water Supply: The Delaware River Basin System
Camden Metro Area Study
Merrill Creek Reservoir Project
Francis E. Water Dam & Reservoir Modification
The Point Pleasant Pumping Station Project
Prompton Reservoir Modification
Tocks Island Lake Project

Unfortunately, our President, Henry H. Reichner, Jr., was unavailable to testify today. However, this will confirm that he and his staff will be more than happy to provide additional information or answer any questions which may be productive in connection with this issue.

Thank you very much for your interest in this matter and your continued efforts on behalf of our region.

Very truly yours,

James P. MacLean, III

JPM/eg

cc: Mr. Henry H. Reichner, Jr.

**Data/Issues**

# WATER SUPPLY: THE DELAWARE RIVER BASIN SYSTEM

**THE PENJERDEL COUNCIL**
THE TRI STATE ASSOCIATION OF BUSINESS, INDUSTRY
AND PROFESSIONS SERVING THE DELAWARE VALLEY
1346 CHESTNUT STREET, SUITE 800, PHILA., PA 19107
(215) 545-1234

## The System

The Delaware River Basin, the Delaware Estuary and Bay, was before the onslaught of industrial man a wholly contained system. Fresh water and silt from the mountains drained into the Atlantic Ocean, and the aquatic inhabitants of the system had adapted to the seasonal invasion of salt water into the Estuary and Bay.

The situation today is drastically different. The growth of industries and population have totally disrupted the natural balance. The Delaware River Basin is now subject to an omnipresent threat of the drought and the prospect of greatly reduced accessible, usable water. The concern, as well as the responsibility, for this situation is shared by the industrial, individual, and ecological elements of the Basin, The PENJERDEL Council is at the forefront of the movement for responsible action for the maximum equitable benefit of all concerned. The Delaware River Basin Commission (DRBC), formed in 1961, is charged with the management of the water and water-related resources of the Basin. In response to this challenge, the Commission developed in 1962, a Comprehensive Plan, which has served as a guide for all subsequent water supply development. Intrinsic to this plan is a system of eight reservoirs. Two of these, Beltzville and Blue Marsh, have already been built; the remaining six are currently in various stages of development. Taken together, these projects will provide for the long-term water management needs of the Delaware River Basin.

## Current Projects

Listed below are the ongoing projects which comprise the Delawar River Basin water management program. Present drought and prevalent water shortage illustrate the inadequacy of the current program.

Beltzville - Pohopoco Creek, Carbon County, PA
There are 66,830 total acre-feet of water storage, used for flow augmentation and flood loss reduction. The facility is currently in operation.

Blue Marsh - Tulpehocken Creek, Berks County, PA
This impoundment is used for flood loss reduction and flow augmentation; it stores 46,990 total acre-feet of water. The facility is currently in operation.

Cannonsville - West branch of the Delaware River, NY
302,000 acre-feet of stored water, used for local water supply and flow augmentation. The site is currently in operation.

Francis E. Walter - Lehigh River, Luzerne, Carbon County, PA
All of this impoundment's 108,000 acre-feet of stored water is devoted to flood loss reduction. While the reservoir is currently operating, there is a proposal to expand it. (See PENJERDEL Council's Position Paper on the Francis E. Walter Reservoir.)

General Jadwin - Dyberry Creek, Wayne County, PA
There are 24,500 acre-feet of water storage, dedicated to flood loss reduction. The reservoir is currently in operation.

Marsh Creek - Marsh Creek, Chester County, PA
Its 15,960 total acre-feet of storage are currently being used for local water control, flow augmentation, and flood loss reduction. The facility is currently in operation.

Mangaup System - Mongaup River, Orange Sullivan County, NY
This impoundment holds 65,630 acre-feet of water used for hydroelectric power. It could potentially be used for flow augmentation. The reservoir is currently in operation.

North Branch - Neshaminy Creek, Bucks County, PA
This impoundment holds 8,464 acre-feet of total water storage, it supplies local water and flood loss reduction. The facility is currently in operation.

Prompton - West branch of Laxawaxen River, Wayne County, PA
25,900 total acre-feet of water are stored here, providing flow augmentation and flood loss reduction. The site is currently in operation and is being considered for modification.

Wallenpaupack - Wallenpaupack Creek, Pike County, PA
This impoundment supplies water for hydroelectric power, but possesses the potential for flow augmentation. The facility holds 157,240 total acre-feet of water in storage. It is currently in operation.

## The Problem

Because of a diversity of sources and uses, the Delaware River Basin represents a complex ecosystem. Sustaining a balance that permits adequate access by all has become an increasingly difficult challenge. Dams, reservoirs, and other water supply mechanisms are outdated and inadequate. Population growth and business development have caused substantial non-replaceable depletion of the Basin's water. What is expected to be the worst drought in the history of the region has dropped area reservoirs to 50% of capacity, drastically reduced river flows, and threatened the intrusion of salt water into the fresh water of the Delaware Estuary. Drought emergency warnings have become a way of life, affecting industrial, recreational, and personal access to water.

This current drought emergency is, according to experts, a foreshadowing of what is to come. The DRBC estimates that by the year 2000 so much water will have been permanently removed from the basin above Trenton, NJ, that salt water from the Atlantic Ocean will damage the fresh water supply of our region. High concentrations of salt increase water treatment equipment and maintenance costs for both industry and residents, endanger the groundwater system, and pose serious health problems. Unless action is taken soon, the future of this region will be in serious jeopardy.

## The Storage System

The basic problem is maintaining the crucial amount of water needed for daily personal and industrial use. The dams, reservoirs, and other water maintenance tools of the system are essential to this end. When the level of the Delaware River drops, the system of storage impoundments are tapped so that industrial and individual activities may continue normally. Unfortunately, the current system was predicated on the belief that storage, groundwater, and the Delaware River would provide enough water for all. This assumption has been proven false.

Permanent removal of water by industrial users has reduced the resource upon which the entire Basin water supply system depends. In 1980, the total depletive use was 684 million gallons per day (mgd). By the year 2000, experts predict that depletive use will reach 1,191 mgd. This increase of 74% in just 20 years is well beyond the U.S. Army Corps of Engineers' minimum definition of a state of disaster.

The flow of the Delaware River must be maintained at no less than 3,100 cfs at Trenton, NJ. During normal conditions, there is adequate storage capacity to maintain this flow. However, any abnormal condition, such as inadequate rain fall, tips the ecological balance and reduces river flow. In this region, the problem has been exacerbated by reductions in area groundwater and by industries whose water needs permanently deplete water supplies.

## Groundwater

The generous ground water system in the Delaware River Basin -- specifically the Camden Area Aquifer -- was once very effective; supplying 50 mgd to the Delaware Valley water system. Levels of water in the aquifer were sufficiently high to repel seepage from the Delaware River; in fact, the aquifer supplied water to the River.

As a result of extensive strain on the aquifer, through industrial and community water withdrawals, the current water level is dangerously low. The groundwater system now draws water from the Delaware River, which has become increasingly contaminated with industrial and other waste. When the flow of the River is low, the salt from the Delaware Bay advances up the Delaware Estuary, threatening the groundwater system. If river water, polluted by salt or untreated wastewater, invades the aquifer, our groundwater will be contaminated for many years. Salinity contamination affects individual and industrial use, as well as the oyster beds in the Delaware Bay. These concerns underscore the need for an adequate water supply control system in the Delaware River Basin.

Over 200 Pennsylvanian water purveyors have projected deficits in yield, storage, or allocation by the year 2000. Currently, 18 suppliers have yield problems, 11 have deficient water allocation, and 54 have storage deficiencies. In five years, 70 will have yield problems, 16 expect water allocation deficiencies and 12 expect insufficient filtration plant capacities. Southern New Jersey is facing a sorely depleted aquifer system, and nothern urban areas of New Jersey are facing severe water shortages which will place a greater burden on the water exporters of the Delaware River Basin. The state of Delaware is not currently under drought conditions, thanks to excellent aquifers. However, their situation will quickly come to resemble New Jersey if control in the disposition of the water is not exercised.

It is painfully clear that the water supply crisis in the Delaware River Basin is not simply a result of the reoccuring dry seasons. Problems such as these require strict measures to countermand them. Action to halt the further deterioration must be taken immediately.

## The Solutions

In 1976, the DRBC initiated deliberations between the Govorners of Delaware, New Jersey, New York, Pennsylvania, the Mayor of New York City--the members of the DRBC. The purpose of these "good faith negotiations," as they came to be known, was to provide long-term solutions to the Basin's inadequate water supply and the approaching chronic water shortage. Early in 1983, the Interstate Water Management Report, the "good faith agreements," was signed by each of the five members. There are 14 specific recommendations contained in the Interstate Water Management Report, all of which are closely related to the findings of the Level B Study, the DRBC's most recent study of the components of its Comprehensive Plan. The PENJERDEL Council endorses all of the recommendations as the most effective strategy to address the Delaware River Basin's water supply crisis. They are:

* Revised salinity-control and sodium standards for the Delaware Estuary must be adopted.

* Reservoir storage levels must be specified as criteria for declaring and ending droughts.

* The 1964-1965 "drought-of-record" must be used as an assumption for water supply planning.

* A formula of cutbacks in water exports, stream-flow objectives, and downstream releases must be adopted in order to conserve storage in droughts.

* All the Basin's reservoirs must coordinate operation to meet water needs and control salinity.

* The Francis E. Walter and Prompton reservoirs must be modified in order to provide storage for water supply and flow augmentation.

* The Merrill Creek Reservoir Project must be built, if found feasible.

* The Cannonsville Reservoir must be enlarged.

* The state of New Jersey should solve the Camden area's groundwater crisis.

* The possibility of up-river groundwater pumping for flow augmentation must be tested.

* The deferred Tocks Island Lake Project must be kept in reserve until after the year 2000.

* The DRBC must adopt a program to reduce depletive uses by 15% during periods of drought.

* Each state must adopt a standby conservation plan, also for 15% savings, during droughts.

* A program must be established to limit future depletive water losses until needed storage is provided.

* The up-basin cold-water fisheries must be improved through reservoir operation.

## Glossary of Common Terms

**ACRE-FOOT:** The volume of water required to cover one acre of land one fo deep; equal to approximately 325, 858 gallons.

**AQUIFER:** A geologic formation that is waterbearing and which transmits water from one point to another.

**CFS:** Cubic feet per second; 1 cfs = 0.646 mgd = 1.983 acre-feet per day.

**DELAWARE ESTUARY:** The tidal portion of the Delaware River between Trenton, NJ, and River Mile 48, the head of the Delaware Bay.

**GOOD FAITH NEGOTIATIONS:** Discussions between the parties to the 1954 U.S. Supreme Court Decree being undertaken pursurant to the DRBC Resolution 78-20.

**GPD:** Gallons per day.

**GROUND WATER:** Water beneath the surface of the ground.

**IMPOUNDMENT:** A dam that stores water for a variety of pruposes, including flow augmentation.

**MANAGED FLOW:** The flow of a river or stream that may be expected to occur as the result of manipulation of surface runoff and baseflow by storage reservoirs, imports, exports, diversions, and changes in depletive uses.

**MGD:** Million gallons per day mgd = 1.547 cfs = 3.07 acre-feet per day.

**REPLACEMENT FACTOR:** The factor applied to the depletive uses of Delaware River water below the mouth of the Schuylkill River (approximately) for determining the amount by which flows must be augmented above the Schuylkill to prevent the advance of the salt front.

**RIVER BASIN:** The area drained by a river and its tributaries.

**SALINITY INTRUSION:** The invasion of salt water into a body of fresh water, occuring in either surface or ground-water bodies.

**SALT FRONT:** The location of the 250 mg/l chloride concentration in the Delaware Estuary.

**WATERSHED:** The area drained by a given stream.

## GENERAL BIBLIOGRAPHY

1. The Delaware River Basin Commission's Level B Study
2. The Delaware River Basin Commission's Annual Reports; 1982, 1983, 1984
3. *Interstate Water Management; Recommendations of the Parties to the U.S. Supreme Court Decree of 1954 to the Delaware River Basin Commission, Pursuant to Commission Resolution 78-20.*
4. *What is the Answer to Better Drought Protection in the Delaware River Basin?* By Kenneth R. Broome, P.E.
5. The General Design Memorandum of the Modification of the Francis E. Walter Dam and Reservoir; Main Report and Environmental Impact Statement. Prepared by the U.S. Army Corps of Engineers, Philadelphia District.
6. The PENJERDEL Position Paper on the Point Pleasant Pumping Station; additional research by John Carson and Associates, Inc.
7. Final Environmental Assessment Report and Findings of the Point Pleasant Water Supply Project, August, 1982.
8. The Testimony of John O'Keeffe, Project Manager, Merrill Creek Reservoir Project.
9. The Central Bucks/Montgomery County Water Supply System Study.
10. *The Facts About Tocks Island*; Prepared by Water Resources Association of the Delaware River Basin.

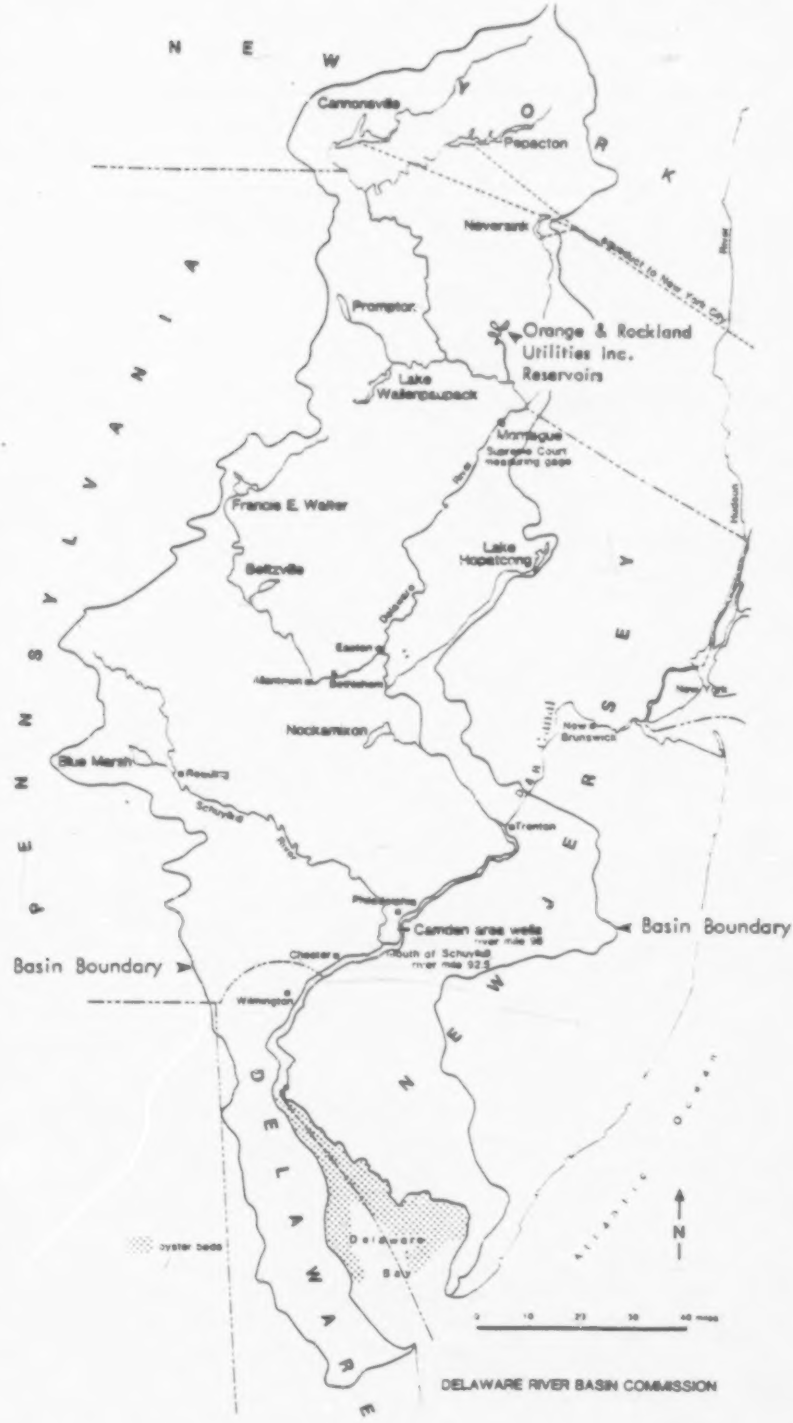
## CONTACTS

The PENJERDEL Council
1346 Chestnut St., Suite 800
Phila., PA 19103

The U.S. Army Corps of Engineers, Philadelphia District
Custom House, 2nd and Chestnut Streets
Philadelphia, PA 19106

Gerald M. Hansler, Executive Director (609) 883-9500
The Delaware River Basin Commission
P.O. Box 7360, 25 State Police Drive
West Trenton, NJ 08628

Bruce E. Stewart, Executive Director (215) 783-0634
Water Resources Association of the Delaware River Basin
P.O. Box 867, Davis Road
Valley Forge, PA 19481


NEW YORK
Cannonsville
Pepacton
Neversink
Aqueduct to New York City
River
Prompton
Orange & Rockland Utilities Inc. Reservoirs
Lake Wallenpaupack
Montague
Supreme Court measuring gage
Hudson
Francis E. Walter
Lake Hopatcong
Beltzville
Delaware
Easton
Allentown
Bethlehem
New York
New Brunswick
Nockamixon
Blue Marsh
Reading
Schuylkill River
Trenton
Philadelphia
Camden area wells river mile 98
Basin Boundary
Chester
Mouth of Schuylkill river mile 92.5
Basin Boundary
Wilmington
PENNSYLVANIA
NEW JERSEY
DELAWARE
Atlantic Ocean
Delaware Bay
oyster beds
N
0 10 20 30 40 miles

DELAWARE RIVER BASIN COMMISSION

**Data/Issues**

**THE PENJERDEL COUNCIL**

THE TRI STATE ASSOCIATION OF BUSINESS, INDUSTRY
AND PROFESSIONS SERVING THE DELAWARE VALLEY
1346 CHESTNUT STREET, SUITE 800, PHILA., PA 19107
(215) 545-1234

# CAMDEN METRO AREA STUDY
## (SOUTHERN NEW JERSEY WATER SUPPLY STUDY)

The PENJERDEL Council urges completion of the Camden Metro Area Study. The problems associated with the Southern New Jersey water supply crisis are urgent; it is vital that they be addressed now, and long-term solutions be found immediately.

### Project Description

Over the past century, the massive aquifer system that has been the water supply source for the three counties (Salem, Gloucester, and Camden) has been severely taxed. Because the water level in the aquifer is so low, the system which once supplied water to the Delaware River is now receiving water from the river. As the level of the aquifer drops, there is less fresh water with which to hold back salinity intrusion. When this happens, the entire water system is threatened. Shallow well levels either drop or become dry. A number of the wells have already been lost.

### Status

The New Jersey Department of Environmental Protection (NJDEP) has begun a water supply feasibility study for the Camden Metro Area. In addition to addressing alternative water supplies for the area, the study will also suggest remedies to the problems of declining and contaminated groudwater. The study is scheduled for completion in December, 1985.

### Sources

Camden Area Metro Study Newsletter, July, 1985, New Jersey Department of Environmental Protection

### Contacts

The PENJERDEL Council
1346 Chestnut St., Suite 800
Philadelphia, PA 19107
(215) 545-1234

Joseph Miri, Ph.D.
Chief, Office of Water Policy
Division of Water Resources
P.O. Box CN 029
Trenton, NJ 08625
(609) 984-7696

**Data/Issues**

THE PENJERDEL COUNCIL
THE TRI STATE ASSOCIATION OF BUSINESS, INDUSTRY
AND PROFESSIONS SERVING THE DELAWARE VALLEY
1346 CHESTNUT STREET, SUITE 800, PHILA., PA 19107
(215) 545-1234

# MERRILL CREEK RESERVOIR PROJECT

The PENJERDEL Council fully supports the Merrill Creek Reservoir Project as an essential part of the Delaware River Basin System. Our review of the proposals for construction of the Reservoir indicates that project designers have shown outstanding creativity in their development of this facility. Merrill Creek will not only aid the overall economy of the region by stabilizing its water supply, but will also provide a sigfuificant recreational and environmental facility to Warren County. The PENJERDEL Council believes that we can no longer afford to delay efforts to provide an adequate water supply in the Delaware River Basin, particularly when superlative projects such as Merrill Creek are available.

## Project Description

The Merrill Creek Reservoir Project will be located in Harmony Township, Warren County, NJ. It will be surrounded by a land preserve of almost 2,500 acres. The reservoir will be designed to store up to 16.2 billion gallons of water from the Delaware River. This reservoir will have three basin functions; flow augmentation, flood control, and recreation. At times when flow of the Delaware River falls below 3,000 cfs at Trenton, NJ, partly caused by electric utilities drawing from the Basin, the Merrill Creek will provide flow augmentation of 220 cfs. It will provide for flood control for downstream communities and will be available as a water source for fire fighting. On the northeast side of the Merrill Creek, a recreational area is planned, complete with educational facilities and numerous nature trails. The project will increase the available habitat of rainbow and brown trout, having beneficial ecological and recreational results.

## Current Status

The Merrill Creek Reservoir Project has been approved by the Delaware River Basin Commission, under the Comprehensive Plan, and is also part of the New Jersey Statewide Water Supply Master Plan.

Having received its permit from the New Jersey Department of Environmental Protection, the Merrill Creek Project needs only to obtain a license from the U.S. Army Corps of Engineers prior to construction. This licensing process should be completed in 1985.

The project will be financed completely through the Merrill Creek Owners Group (MCOG): Atlantic City Electric Co., Delmarva Power and Light Co., Metropolitan Edison Co., Pennsylvania Power and Light Co., Philadelphia Electric Co., and Public Service Electric and Gas Co. The Merrill Creek Reservoir Project will cost an estimated $170 million for construction in 1987.

## Sources

The Delaware River Basin Commission's Level B Study

The Testimony of John O'Keeffe, Project Manager, Merrill Creek Reservoir Project, Public Service Electric and Gas Co.

## Contacts

The PENJERDEL Council
1346 Chestnut Street, Suite 800
Philadelphia, PA 19107
(215) 545-1234

Harvey Schram
Site Manager
Merrill Creek Reservoir Project
RD 3, P.O. Box 147
Philipsburg, NJ 08865

John O'Keeffe
Project Manager
Merrill Creek Reservoir Project
Public Service Electric and Gas Co.
80 Park Plaza - 18 E
Newark, NJ 07101
(201) 430-7000

**Data/Issues**

THE PENJERDEL COUNCIL
THE TRI STATE ASSOCIATION OF BUSINESS, INDUSTRY
AND PROFESSIONS SERVING THE DELAWARE VALLEY
1346 CHESTNUT STREET, SUITE 800, PHILA., PA 19107
(215) 545-1234

# FRANCIS E. WALTER DAM & RESERVOIR MODIFICATION

The PENJERDEL Council fully endorses modification of the Francis E. Walter Dam as a tool for providing adequate water supplies for the Delaware River Basin.

## Project Description

The Francis E. Walter Dam is located on the Lehigh River about 75 miles upstream from Easton, PA and 3 miles north of the intersection of the Pennsylvania Turnpike's Northeast Extension and Interstate 80. Located in the Pocono Mountains, the Francis E. Walter Dam is 5 miles south of the town of White Haven, and 10 miles northwest of the city of Wilkes-Barre/Scranton.

The proposed project modification includes: raising the existing dam 30 feet, from 1494.9' to 1504'; raising the dike embankments; constructing a new spillway and intake tower; constructing new maintainence facilities; and relocating the existing Bear Creek Road. The modification will augment the flow of the Delaware River, enhance the supply of groundwater, and help control salinity intrusion of the Delaware Estuary.

Maintaining the flow of the Delaware River is essential to satisfying the growing demand for water by communities and industries in Pennsylvania, New Jersey, and Delaware. Currently, Pennsylvania and New Jersey water supplies cannot meet needs during periods of drought. Studies indicate that unless the storage capacity of the Delaware River Basin is increased by the year 2020, water supplies will be inadequate to support not only New Jersey and Pennsylvania, but the state of Delaware as well.

Many areas in the Delaware River Basin rely heavily on groundwater. Recently, users have experienced shortages due to greatly decreased supply and increased demand. With the new construction, the Walter Dam will expand the system's storage capacity, thus reducing reliance on precious groundwater. Finally, the proposed Dam and Reservoir modification will limit salt water intrusion which threatens the fresh water of the Delaware River and related aquifers. When the level of the Delaware River drops because of decreases in natural sources and/or increases in water consumption, the salt front moves upstream from the Delaware Bay into the Delaware Estuary. During droughts, such concentration threatens the water supplies of Philadelphia, Camden, and the entire Southern New Jersey area. The Francis E. Walter modification, in conjuction with the other projects recommended by the Delaware River Basin Commission and endorsed by the PENJERDEL Council will provide relief from this extremely serious problem.

## Status

The Francis E. Walter Dam & Reservoir Modification has been recommended for federal development in U.S. House of Representatives Document 522-87-2 and authorized for construction by PL 87-874. The advanced engineering and design study as well as the final environmental impact statement have been completed. The project is scheduled for construction between FY 86 and FY 92, at a cost of approximately $112 million.

## Sources

The Delaware River Basin Commission's Level B Study

The General Design Memorandum of the Modification of the Francis E. Walter Dan and Reservoir; Main Report and Environmental Impact Statement, prepared by the U.S. Army Corps of Engineers, Philadelphia District, February, 1985

## Contacts

The PENJERDEL Council
1346 Chestnut St., Suite 800
Philadelphia, PA 19107
(215) 545-1234

Paul Gaudini
Project Engineer
U.S. Army Corps of Engieers
Philadelphia District
Custom House
2nd & Chestnut Sts.
Philadelphia, PA 19106
(215) 597-4788

Wayne Jerrett
Township Manager
Kidder Township Municipal Bldg.
P.O. Box 374
Lake Harmony, PA 18624
(717) 722-0107

John McSparran
Dept. Environmental Resources
Bureau of Water Resources
P.O. Box 1467
Harrisburg, PA 17120
(717) 783-5338

**Data/Issues**

**THE PENJERDEL COUNCIL**

THE TRI-STATE ASSOCIATION OF BUSINESS, INDUSTRY
AND PROFESSIONS SERVING THE DELAWARE VALLEY
1346 CHESTNUT STREET, SUITE 800, PHILA., PA 19107
(215) 546-1234

# THE POINT PLEASANT PUMPING STATION PROJECT

The PENJERDEL Council strongly endorses the Point Pleasant Pumping Station Project as an environmentally sound means of ensuring needed water supplies for Central Bucks and Montgomery Counties. Since the inception of the project in the late 1960's, and during numerous challenges to it through the years, the PENJERDEL Council has joined the majority of experts in supporting development of Point Pleasant.

## Project Description

The Point Pleasant Pumping Station has been a part of the Neshaminy Water Resources Authority's Regional Water Supply Plan since the late 1960's, and has been approved by the DRBC. Acknowledgement of the water supply crisis in Bucks and Montgomery Counties was established in January of 1981 when the DRBC created the Southeastern Pennsylvania Groundwater Protected Area and imposed strict regulation of water resources.

The Point Pleasant Pumping Station is envisioned as a tool for supplementing the public water supplies of Bucks and Montgomery Counties, which have been experiencing an increasing need for water. Central Montgomery County, with a population of more than 150,000 in 15 communities, has become the region's fastest growing and most critical water shortage area. A series of droughts has damaged crops and affected hardships on residents and businesses. Groundwater supplies are dangerously low. The water supply requirements of the Philadelphia Electric Company's Limerick Nuclear Generating Station, designed to provide much needed power to the region, are not being met. Point Pleasant is seen as a cost-effective, efficient long-term solution to these problems, which, with some construction already accomplished, will require only three more years of work to become operational.

The Point Pleasant Pumping Station will divert 95 million gallons of water per day from the Delaware River and carry it 2.4 miles to the proposed Bradshaw Reservoir. From Bradshaw, the water will continue to the North Branch of Neshaminy Creek, flow through Lake Galena (already completed) to the North Branch Water Treatment Plant in Chalfont, and finally to retail water supply systems in Bucks and Montgomery Counties.

The Water Treatment Plant in Chalfont will be built in two phases. The first phase would provide 20 million gallons for immediate use. The second phase, to be completed between 1990 and 2000, would provide 29 mgd. The remaining 46 mgd from the diverted 95 mgd would be used by the Philadelphia Electric Company at the Limerick Nuclear Generating Facility.

## Status

The Point Pleasant Pumping Station has been partially built, and all lands necessary for the entire system have been aquired. Bucks County has constructed six flood control dams, two multi-purpose reservoirs and two parks. To date, the estimated cost of the project is $35 million.

In the late 1970's, the environmental and anti-nuclear movements sweeping the country pushed Point Pleasant into the national limelight. Since 1980, Point Pleasant has been the subject of four Environmental Impact Statements and three federal court cases. Bucks County withdrew its support and on February 9, 1984, the Neshaminy Water Resources Authority ordered stoppage on construction indefinitely.

However, through these repeated challenges, numerous studies have confirmed the developmental benefits of Point Pleasant and its minimum environmental impact. The experts who have reviewed the project report that the Pumping Station will improve stream and river flows, protect ground water and stabilize water supply.

Recently, Bucks County President Judge Isaac Garb removed the project from Bucks County jursisdiction and awarded control to two Montgomery County Water Authorities; North Penn and North Wales. Judge Garb ruled that Bucks County had "materially and substantially breached their contract obligation." The Neshaminy Water Resources Authority has appealed the decision and oral argumerts were heard on June 5, 1985. A decision is expected to be handed down in August, 1985.

## Contacts

Kenneth E. Shull, Chairman
Environmental Improvement Committee
The PENJERDEL Council
1346 Chestnut St., Suite 800
Philadelphia, PA 19107
(215) 545-1234

Harry Borchers
Executive Manager
North Penn Water Authority
P.O. Box 591
Lansdale, PA 19446
(215) 855-3617

John Carson, President
John Carson and Associates, Inc.
95 Cherry Lane
Doylestown, PA 18901
(215) 348-8261

Dale Hartshorne
Manager, State Gov't Relations
Merke Sharp and Dohme
West Point, PA 19486
(215) 661-5000

**Data/Issues**

**THE PENJERDEL COUNCIL**

THE TRI-STATE ASSOCIATION OF BUSINESS, INDUSTRY
AND PROFESSIONS SERVING THE DELAWARE VALLEY
1346 CHESTNUT STREET, SUITE 800, PHILA., PA 19107
(215) 546-1234

# PROMPTON RESERVOIR MODIFICATION

The continued health and development of the Delaware Valley Region depends on a safe and secure water supply. The PENJERDEL Council contends that the area's present water supply crisis and its long-term aqua needs demand immediate action. Key to this is the modification of the Prompton Reservoir, a central element of the Delaware River Basin Commission's Preferred Plan. Delay of such a significant proposal can no longer be warranted; adequate water supply for the Delaware River Basin must be secured.

## Project Description

Prompton Reservoir is located in the valley of the Lackawaxen River, about 4 miles west of Honesdale, PA. The modification of the Prompton Reservoir will provide for flow augmentation and recreational use, in addition to flood control. Once the modification is completed, the reservoir will store 30,900 acre feet of water for low-flow augmentation of the Delaware River--130 cfs over a 120-day period. The existing lake will be increased from 290 acres to 720 acres. Due to mediocre terrain, the area surrounding the Prompton Reservoir was not originally intended for recreational purposes. However, the number of annual visitors has warranted a change in plans. There will be an additional 997 acres of parkland and recreational accommodations for 250,000 visitors annually. Operation of the modified Prompton Reservoir will be considerate of downstream flow requirements for fisheries. The reservoir may also serve as a lake fishery, to further actualize Prompton's recreational assets.

## Current Status

The Prompton Reservoir Modification has been approved by the Delaware River Basin Commission and is a component of the DRBC's Comprehensive Plan. Preliminary studies have been conducted and construction slated for completion by 1995. Total new construction cost will be $45.34 million, with an investment cost of $28.5 million.

## Sources

The Delaware River Basin Commission's Level B Study

**Contacts**

The PENJERDEL Council
1346 Chestnut St., Suite 800
Philadelphia, PA 19107
(215) 545-1234

John Burnes, Ph.D.
Chief Planner
U.S. Army Corps of Engineers
Philadelphia District
Custom House
2nd & Chestnut Sts.
Philadelphia, PA 19106
(215) 597-5950

Dawes Thompson
Public Information Officer
Delaware River Basin Commission
P.O. Box 7360
25 State Police Drive
West Trenton, NJ 08628
(609) 883-9500

Wayne County Department of Planning
Courthouse
Honesdale, PA 18431
(717) 253-5870

**Data/Issues**

**THE PENJERDEL COUNCIL**

THE TRI STATE ASSOCIATION OF BUSINESS, INDUSTRY
AND PROFESSIONS SERVING THE DELAWARE VALLEY
1346 CHESTNUT STREET, SUITE 800, PHILA., PA 19107
(215) 545-1234

# TOCKS ISLAND LAKE PROJECT

The PENJERDEL Council emphatically supported the Delaware River Basin Commission's 1983 "Good Faith" agreement. Included in the 14 specific recommendations of the agreement was the endorsement of the Tocks Island Lake Project as a reserved alternative--to be considered after the year 2000--if circumstances warrant.

## Project Description

The Tocks Island Lake Project is designed for enhanced water supply, flood control, production of hydroelectric power, and recreational facilities. The proposed site is on the Delaware River, about 5 miles upstream from the Delaware Water Gap. The dam will contain 3.5 million cubic yards of earth and rock, and will be 3,200' feet long and 456 feet high. The reservoir formed by this dam will extend approximately 37 miles up Flat Brook. 14,800 acres of land will be needed for construction with an additional 9,500 acres for related recreation. Land requirements total 62,370 acres.

Construction of the Tocks Island Lake Project offers a number of advantages. First, the reservoir will provide 950 cfs for flow augmentation of the River--27% more than the total output of the five alternate projects--Francis E. Walter Modification (290 cfs), Prompton Modification (130 cfs), Hackettstown (130 cfs), Merrill Creek (220 cfs), and Cannonsville Modification (85 cfs). Second, Tocks Island will be able to accommodate the water resulting from substantial floods. Third, the project will divert water to hydroelectric facilities, producing more than 280 million kilowatt-hours per year. Fourth, the Tocks Island National Recreation area, an essential part of this development, will be capable of serving almost 7 million visitors annually, with extensive water and other outdoor sports facilities. All of these benefits promise to strengthen the economy of the area and provide much needed, long-term employment for residents.

## Status

In 1975, the Tocks Island Lake Project was deferred until after the year 2000. In 1983, this decision was reiterated in the Interstate Water Management Report, the "Good Faith" agreement, and the DRBC's Comprehensive Plan was modified accordingly. The project has been challenged by political and environmental conflict since its conception. Over 65% of the needed land has been purchased. The final Environmental Impact Statement has been filed and federal government authorization for development secured. The estimated cost for the project was $491 million in 1979.

**Sources**

"The Facts About Tocks Island" prepared by Water Resources Association of the Delaware River Basin

The Delaware River Basin Commission's Level B Study

**Contacts**

Kenneth E. Shull, Chairman
Environmental Improvement Committee
The PENJERDEL Council
1346 Chestnut St., Suite 800
Philadelphia, PA 19107
(215) 545-1234

Dawes Thompson
Public Information Officer
Delaware River Basin Commission
P.O. Box 7360
25 State Police Drive
West Trenton, NJ 08628
(609) 883-9500

## SUMMARY

The Middlesex County Utilities Authority (MCUA) Wastewater Treatment Plant, located in Sayreville, New Jersey has an average daily discharge to the Raritan Bay of approximately 80 mgd (million gallons per day). Due to MCUA's large effluent flow and close proximity to a significant number of high water use industrial plants (Figure 1-1) there exists potential for effluent reuse within Middlesex County. Secondary effluent resulting from the existing wastewater treatment plant can be diverted to additional advanced wastewater treatment processes to produce a high quality effluent which can then be pumped to industries for process and/or cooling water use.

Based on the identification of potential water users and their relative locations to each other and to MCUA four individual water reuse distribution routes were developed. Each route has been evaluated individually and in combination with other routes. In addition to evaluating various distribution systems four different reuse treatment processes (Dual Media Filtration, Carbon Adsorption, Lime Treatment, and Carbon Adsorption/Tertiary Lime Treatment) have been evaluated. In each alternative on reuse, treatment facilities and a distribution pump station would be located to MCUA.

Capital costs for the distribution systems vary from $8.5 million for the Southwest Branch to $16.9 million for the Northeast Branch and $51.6 for the entire distribution system. The entire distribution system consists of the South, Southwest,

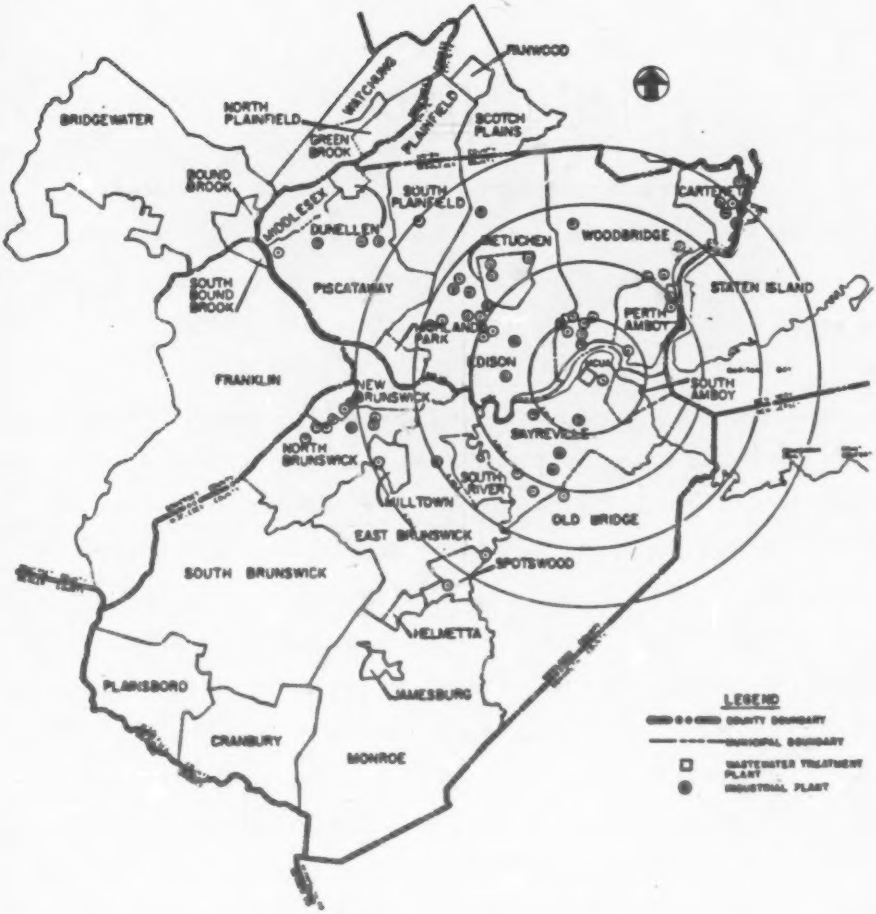

FANWOOD
NORTH PLAINFIELD
WATCHUNG
PLAINFIELD
BRIDGEWATER
GREEN BROOK
SCOTCH PLAINS
BOUND BROOK
SOUTH PLAINFIELD
CARTERET
MIDDLESEX
DUNELLEN
METUCHEN
WOODBRIDGE
SOUTH BOUND BROOK
PISCATAWAY
STATEN ISLAND
HIGHLAND PARK
PERTH AMBOY
EDISON
FRANKLIN
NEW BRUNSWICK
SOUTH AMBOY
NORTH BRUNSWICK
SAYREVILLE
SOUTH RIVER
MILLTOWN
OLD BRIDGE
EAST BRUNSWICK
SPOTSWOOD
SOUTH BRUNSWICK
HELMETTA
JAMESBURG
PLAINSBORO
CRANBURY
MONROE
LEGEND
COUNTY BOUNDARY
MUNICIPAL BOUNDARY
WASTEWATER TREATMENT PLANT
INDUSTRIAL PLANT

FIGURE 1-1 SIGNIFICANT INDUSTRIAL WATER USERS

Northwest and Northeast Branches. When the capital costs for a pump station and reuse treatment processes are added to the entire distribution system the total capital cost for the water reuse system is $57.1 million with Dual Media Filtration, $59.8 million with Carbon Adsorption, $69.2 with Lime Treatment and $71.4 million with Carbon Adsorption/Tertiary Lime Treatment.

These capital costs amortized over 20 years at 8 percent interest plus yearly operation and maintenance costs have been calculated to generate water reuse costs for the various combinations of distribution pipelines and treatment processes. Costs vary from a low of $0.64/1,000 gal. for the South Branch distribution pipeline with Dual Media Filtration to a high of $2.12/1,000 gal. for the Northwest Branch distribution pipeline with Carbon Adsorption/Tertiary Lime Treatment. Of the four wastewater treatment processes evaluated Dual Media Filtration is the least expensive for the quality of water produced. Costs for water produced by this reuse system are less than $1.00/1,000 gal. This is well below the current Elizabethtown Water Company rate of $1.37/1,000 gal.

As a result of this preliminary investigation it appears that water reuse is economically feasible within the MCUA service area. The Southwest Branch is the only portion of the distribution system which is not economically feasible. However, this portion of the distribution system when included with the entire distribution system or water reuse system is also economically feasible.

## Conclusion

Based on the cost effectiveness evaluation of the various water reuse systems in this study, water reuse is an economically feasible alternative to buying potable water. However, in order to attract the interest of large water users the potential savings to an industry must be maximized. This means selecting the least expensive wastewater treatment process that meets the water quality needs of your primary users.

## INTRODUCTION

Water is a limited natural resource and as its demand increases so will its cost. Presently there is one source of water in Middlesex County which is essentially untapped. This source is reused wastewater. MCUA presently provides secondary treatment to an average flow of 80 mgd of wastewater. This wastewater is then discharged to the Raritan Bay. With advanced wastewater treatment the quality of this secondary effluent can be improved, at minimal cost, to a point where sufficient industries could buy it for process and/or cooling water. The result of water reuse would be conservation of a limited resource and reductions in industrial operating budgets.

This study presents the following:

1. Potential industrial users.
2. Distribution routes.
3. Treatment systems.
4. Comparison of water reuse rates.
5. Potential savings to industries.

## DATA EVALUATION

### Water Useage

Several sources have been used to collect information regarding the quantity of water used by industries within the MCUA service area. The first source gives water consumption and sewer discharge flows that were tabulated from data collected during Industrial Pretreatment Program Industrial Waste Survey, Part I. A second source had estimated 1983 sewer discharge flows directly to the MCUA collection system from MCUA direct industrial participants. The final source of water useage information was a computer output of all process and/or cooling water discharges to the Rarian River and its tributaries. Significant water users from the above sources have been tabulated in Table 3-1. A significant water user has been defined as anyone who either uses or discharges greater than 50,000 gallons of water per day.

Industries listed in Table 3-1 were eliminated from consideration if they were located greater than about ten miles from MCUA, greater than about a mile from adjacent industries or if their primary water use could not be met. Each industry was located on a map in order to determine its distance from MCUA and its relative location to other industries. Then each industries water requirements were evaluated based on what products that company produced. Companies which prepare food products or pharmaceutical goods may have large water requirements but require

TABLE 3-1. SIGNIFICANT WATER USERS

| Water Users | Flows (gpd) Water Consumption | Significant Discharge to MCUA | 1983 Estimated Flows of Participants | Discharge to Raritan River |
|---|---|---|---|---|
| ITT Continental Baking Co. | 168,897 | 66,000 | - | - |
| GMC Deloo Remy Div. | 223,840 | 153,333 | - | - |
| Rhone-Poulenc Chemicals Co. | 347,321 | 162,030 | - | - |
| Squibb, E.R. & Sons, Inc. | 1,797,883 | 1,530,00 | - | - |
| The Lummus Co. | 209,977 | - | - | - |
| Personal Products (J&J) | 594,140 | 172,602 | - | - |
| Airtemp Corp. (Fedders) | 242,597 | - | - | - |
| American Can Co. | 213,750 | 153,000 | - | - |
| Ford Motor Co. Edison Assy. Plant | 588,632 | 366,000 | - | 190,000 |
| Kaiser Aluminum & Chemical | 218,014 | 183,622 | - | - |
| Stauffer Chemical Co. | 926,142 | 550,000 | 600,000 | - |
| Revlon Inc. | 427,470 | 259,400 | - | - |
| Tenneco Chemical Inc. (Edison) | 290,104 | - | - | - |
| Edison N.J. Products Co. | 229,218 | 118,000 | - | - |
| Mobil Chemical Co.-Chemical Coating | 358,363 | 45,000 | - | - |
| Beecham Laboratories | 451,876 | 138,000 | - | - |
| Tenneco Chemicals Inc. (Piscataway) | 266,586 | 176,000 | - | - |
| Union Carbide Corp. Polyclefins Div. | 1,954,519 | 1,000,000 | 640,000 | - |
| Saytech Inc. | 382,462 | 240,000 | - | - |
| Sunshine Biscuits Inc. | 123,781 | 100,000 | - | - |
| Okonite Co. | 211,910 | - | - | - |
| Johnson & Johnson Research | 209,743 | 78,000 | - | - |
| J&J Excelsior | 254,983 | - | - | - |
| Premium Plastics Inc. | 131,034 | - | - | - |
| Northeastern Prod. Co. Subs. Campbel S. | 170,588 | 63,960 | - | - |
| Dreyfuss, L.A. Co. | 121,243 | 100,000 | - | - |
| Chevron USA Inc. | 4,093,574 | - | - | - |
| Intercon Co. | 119,767 | - | - | - |
| American Cyanamid | 162,492 | - | - | - |
| Engelhard Industries Inc. | 150,770 | - | - | - |
| U.S. Metal Refining Co. | 2,053,346 | - | - | - |
| Reichold Chemical Co. | 323,998 | - | - | - |
| Westvaco Min. Pro. Div. FMC | 570,326 | - | - | 222,315 |
| Gatx Terminals Div. | 167,803 | - | - | - |
| Metropak Containers Sub of Kraft | 322,024 | - | - | - |
| Hatco Chemical | 224,643 | - | 150,000 | - |

TABLE 3-1 (continued). SIGNIFICANT WATER USERS

| | Flows (gpd) | | | |
|---|---|---|---|---|
| Water Users | Water Consumption | Significant Discharge to MCUA | 1983 Estimated Flows of Participants | Discharge to Raritan River |
| Tenneco Chemicals Heyden Div. (Ford Plant) | 942,106 | 528,000 | 440,000 | - |
| Indiana Gen. Electronic Div. | 406,509 | - | - | - |
| Reynolds Metals | 961,295 | - | - | - |
| PSE&G Co. | 1,331,538 | - | - | - |
| C&P Chemicals Inc. | 552,017 | - | - | - |
| Linde Div. Union Carbide | 168,649 | - | - | - |
| Mineral Chem. Div. (Engelhard Corp.) | 189,113 | - | - | - |
| P.Q. Corp. | 124,627 | - | - | - |
| Economics Lab Co. | 149,564 | - | - | - |
| Air Products & Chemicals, Inc. (Middlesex) | 78,742 | 70,455 | - | 61,550,000 |
| Algro Knitting Mills Inc. | - | 450,000 | - | - |
| Amerchol Corp. | - | 175,000 | - | - |
| Busch Industrial Products Corp. | - | 698,767 | 750,000 | 1,500,000 |
| E.I. Dupont De Nemours & Co.Inc. | - | 300,027 | - | 2,200,000 |
| Hercules, Inc. | - | 4,810,000 | 5,970,000 | 270,000 |
| Gulton Industries, Inc. - Piezo Prod. | 66,986 | - | - | - |
| Insul-Coustic Div. of Celotx Co. | 66,186 | 19,000 | - | - |
| Kimberly-Clark Corp. | - | 4,500,000 | - | - |
| National Can Corp. | - | 300,000 | - | 50,000 |
| National Starch & Chemical Corp. | - | 550,000 | - | - |
| Oakite Products, Inc. | 64,525 | 32,940 | - | - |
| Old Bridge Chemicals Inc. | - | 100,000 | - | - |
| R.J.R Foods, Inc. | - | 150,000 | - | - |
| The Sherwin-Williams Co. | - | 125,000 | 350,000 | - |
| Schweitzer US | - | - | 3,880,000 | - |
| Triangle Conduit & Cable Co. | - | - | - | 548,220 |
| Jersey Central Power & Light | | | | |
| (South Amboy/City) | - | - | - | 29,880,000 |
| (Sayreville Boro.) | - | - | - | 308,050,000 |
| Parkway Plastics Inc. | - | - | - | 67,200,000 |
| Whitestone Products Co. | - | - | - | 3,540,000 |
| Prodelin Inc. Div. M/A Comm. | - | - | - | 33,000,000 |
| Air Products & Chemicals, Inc. (Dayton) | - | 70,500 | - | - |
| Chicopee | - | 62,540 | - | - |
| FDI Inc. Lee Filter Div. | - | 52,500 | - | - |
| Thermo National Industrial Inc. | - | 54,000 | - | - |
| Vanguard Research Associates | - | 55,045 | - | - |

potable quality water. Thus they have been eliminated from consideration or assigned a lower water useage as an estimate of their cooling water requirements. Table 3-2 lists those industries which were not eliminated along with their useage rate and minimum required level of treatment. After each industry was located and assigned a water useage rate (mpd) possible distribution routes were developed.

## Distribution Route

The objective of water reuse distribution routes is to provide water to the largest water users using the shortest distribution routes. Based on this methodology the distribution routes shown in Figure 3-1 were developed. Each distribution route makes up one branch of the entire distribution system.

Those industries that makeup each branch of the distribution system are listed by branch in Tables 3-3 through 3-6. When all four branches are combined to form one water reuse distribution system the total flow is approximately 24.2 million gallons per day (mgd). It should be noted that this total is not the sum of each branch since the Northeast and Northwest Branches have two companies which are common to both branches.

TABLE 3-2. INDUSTRIAL USEAGE RATES AND TREATMENT

| Industry | Present Useage Rate (mgd) | Estimated Reuse (%) | Usage Rate (mgd) | Min. Required Level of Treatment |
|---|---|---|---|---|
| Kimberly-Clark Corp. | 4.50 | 40 | 1.8 | Dual Media Filtration |
| Busch Ind. Pro. Corp. | 2.20 | 40 | 0.9 | Secondary |
| Hercules, Inc. | 5.08 | 80 | 4.1 | Dual Media Filtration |
| E.I. Dupont De Nemours & Co., Inc. | 2.50 | 70 | 1.8 | Dual Media Filtration |
| Okonite Co. | 0.21 | 50 | 0.1 | Dual Media Filtration |
| The Lummus Co. | 0.20 | 50 | 0.1 | Dual Media Filtration |
| Rhone-Poulenc Chemicals Co. | 0.35 | 80 | 0.3 | Dual Media Filtration |
| Personal Products (J&J) | 0.59 | 10 | 0.1 | Dual Media Filtration |
| Algro Knitting Mills, Inc. | 0.45 | 50 | 0.2 | Dual Media Filtration |
| Squibb, E.R. & Sons, Inc. | 1.80 | 10 | 0.2 | Secondary |
| Saytech, Inc. | 0.38 | 80 | 0.3 | Dual Media Filtration |
| Union Carbide Corp. Polyclefins Div. | 1.95 | 80 | 1.6 | Dual Media Filtration |
| National Can Corp. | 0.35 | 80 | 0.3 | Dual Media Filtration |
| Tenneco Chemicals, Inc. (Piscataway) | 0.27 | 80 | 0.2 | Dual Media Filtration |
| Amerchol Corp. | 0.18 | 80 | 0.1 | Dual Media Filtration |
| Kaiser Aluminum & Chemical | 0.22 | 80 | 0.2 | Dual Media Filtration |
| American Can Co. | 0.21 | 80 | 0.2 | Dual Media Filtration |
| Edison, NJ Products Co. | 0.23 | 50 | 0.1 | Dual Media Filtration |

TABLE 3.2 (continued). INDUSTRIAL USEAGE RATES AND TREATMENT

| Industry | Present Useage Rate (mgd) | Estimated Reuse (%) | Usage Rate (mgd) | Min. Required Level of Treatment |
|---|---|---|---|---|
| Mobil Chemical Co.- Chemical Coating | 0.36 | 80 | 0.3 | Dual Media Filtration |
| Tenneco Chemical, Inc. (Edison) | 0.29 | 80 | 0.2 | Dual Media Filtration |
| Ford Motor Co. Edison Assy. Plant | 0.78 | 80 | 0.6 | Dual Media Filtration |
| Stauffer Chemical Co. | 0.93 | 80 | 0.7 | Dual Media Filtration |
| Tenneco Chemicals Hyden Div. (Fords Plant) | 0.94 | 80 | 0.8 | Dual Media Filtration |
| Indiana Gen. Elect. Div. | 0.41 | 50 | 0.2 | Dual Media Filtration |
| Linde Div. Union Carbide | 0.17 | 80 | 0.1 | Dual Media Filtration |
| Intercon Co. | 0.12 | 50 | 0.1 | Dual Media Filtration |
| Westvaco Min. Pro. Div. FMC | 0.57 | 50 | 0.3 | Dual Media Filtration |
| Metropak Containers | 0.32 | 80 | 0.3 | Dual Media Filtration |
| Gatx Terminals Div. | 0.17 | 80 | 0.1 | Dual Media Filtration |
| Economics Lab Co. | 0.15 | 50 | 0.1 | Dual Media Filtration |
| Engelhard Industries, Inc. | 0.15 | 50 | 0.1 | Dual Media Filtration |
| Reynolds Metals | 0.96 | 80 | 0.8 | Dual Media Filtration |
| Reichold Chemical Co. | 0.32 | 80 | 0.3 | Dual Media Filtration |
| U.S. Metal Refining Co. | 2.05 | 80 | 1.6 | Secondary |
| PSE&G Co. | 1.33 | 80 | 1.1 | Secondary |
| C&P Chemicals Inc. | 0.55 | 80 | 0.4 | Dual Media Filtration |
| Chevron USA Inc. | 4.09 | 80 | 3.3 | Dual Media Filtration |
| Hatco Chemical | 0.22 | 80 | 0.2 | Dual Media Filtration |

NOTE: If any portion of the reuse flow is to be used for other than cooling water purposes then Dual Media Filtration is required.

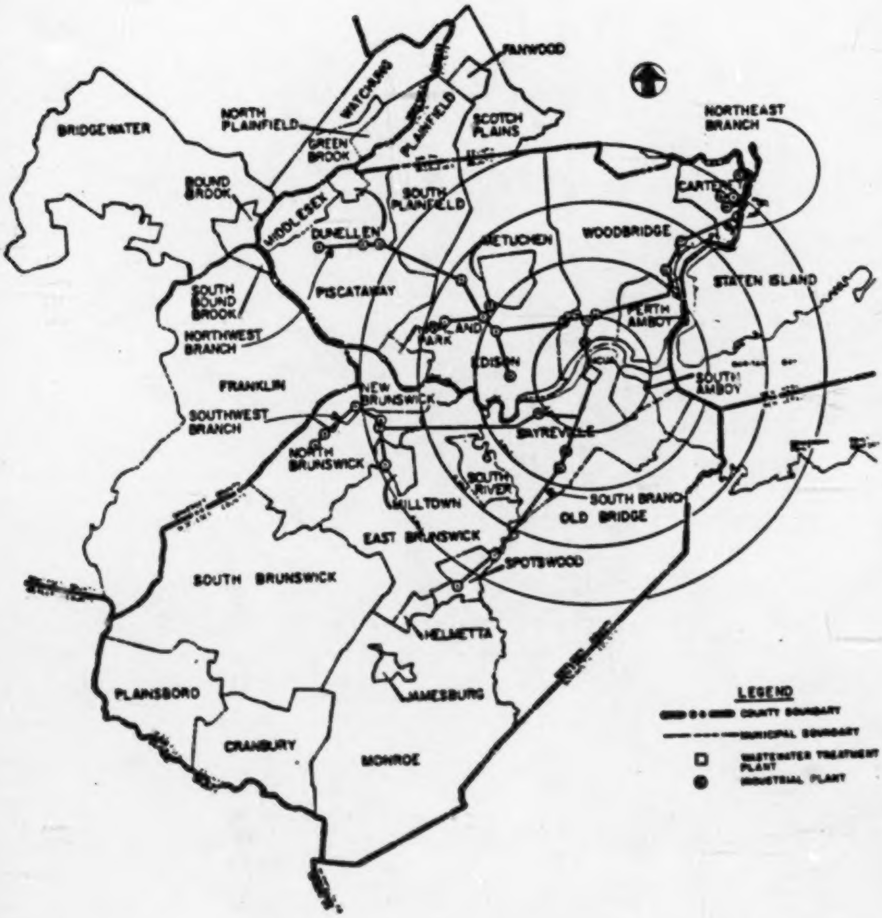

FANWOOD
WATCHUNG
PLAINFIELD
NORTH PLAINFIELD
GREEN BROOK
SCOTCH PLAINS
BRIDGEWATER
NORTHEAST BRANCH
BOUND BROOK
MIDDLESEX
SOUTH PLAINFIELD
DUNELLEN
CARTERET
METUCHEN
WOODBRIDGE
STATEN ISLAND
PISCATAWAY
SOUTH BOUND BROOK
NORTHWEST BRANCH
HIGHLAND PARK
EDISON
PERTH AMBOY
SOUTH AMBOY
FRANKLIN
NEW BRUNSWICK
SOUTHWEST BRANCH
SAYREVILLE
NORTH BRUNSWICK
SOUTH RIVER
MILLTOWN
SOUTH BRANCH
OLD BRIDGE
EAST BRUNSWICK
SPOTSWOOD
SOUTH BRUNSWICK
HELMETTA
JAMESBURG
PLAINSBORO
CRANBURY
MONROE
LEGEND
COUNTY BOUNDARY
MUNICIPAL BOUNDARY
WASTEWATER TREATMENT PLANT
INDUSTRIAL PLANT

FIGURE 3-1 WATER DISTRIBUTION ROUTES

## TABLE 3-3. SOUTH BRANCH

| Upstream Industry | to | Downstream Industry | Distance Between Industries (ft.) | Industrial Use (mgd) | Accumulated Use (mgd) |
|---|---|---|---|---|---|
| Kimberly-Clark Corp. | | Busch Ind. Pro. Corp. | 9,500 | 1.8 | 1.8 |
| Busch Ind. Pro. Corp. | | Hercules, Inc. | 19,600 | 0.9 | 2.7 |
| Hercules, Inc. | | E.I. Dupont De Nemours & Co.,Inc. | 3,400 | 4.1 | 6.8 |
| E.I. Dupont De Nemours & Co. Inc. | | Middlesex County Utilities Authority | 15,400 | 1.8 | 8.6 |

## TABLE 3-4. SOUTHWEST BRANCH

| Upstream Industry | to | Downstream Industry | Distance Between Industries (ft.) | Industrial Use (mgd) | Accumulated Use (mgd) |
|---|---|---|---|---|---|
| Okonite Co. | | The Lummus Co. | 3,200 | 0.1 | 0.1 |
| The Lummus Co. | | Rhone-Poulenc Chemicals Co. | 7,400 | 0.1 | 0.2 |
| Rhone-Poulenc Chemicals Co. | | Personal Products (J&J) | 5,100 | 0.3 | 0.5 |
| Personal Products (J&J) | | Squibb, E.R. & Sons,Inc. | 200 | 0.1 | 0.6 |
| Algro Knitting Mills,Inc. | | Squibb, E.R. & Sons,Inc. | 7,200 | 0.2 | 0.2 |
| Squibb, E.R. & Sons,Inc. | | Saytech Inc. | 28,900 | 0.2 | 1.0 |
| Saytech Inc. | | Middlesex County Utilities Authority | 16,400 | 0.3 | 1.3 |

TABLE 3-5. NORTHWEST BRANCH

| Upstream Industry to | Downstream Industry | Distance Between Industries (ft.) | Industrial Use (mgd) | Accumulated Use (mgd) |
|---|---|---|---|---|
| Union Carbide Corp. Polyolefins Div. | National Can Corp. | 8,000 | 1.6 | 1.6 |
| National Can Corp. | Tenneco Chemicals Inc. (Piscataway) | 2,500 | 0.3 | 1.9 |
| Tenneco Chemicals Inc. (Piscataway) | Amerchol Corp. | 16,300 | 0.2 | 2.1 |
| Amerchol Corp. | Mobil Chemical Co. - Chemical Coating | 7,000 | 0.1 | 2.2 |
| Kaiser Aluminum & Chemical | American Can Co. | 2,000 | 0.2 | 0.2 |
| American Can Co. | Mobil Chemical Co. - Chemical Coating | 7,100 | 0.2 | 0.4 |
| Edison, N.J. Products Co. | Mobil Chemical Co. - Chemical Coating | 2,600 | 0.1 | 0.1 |
| Mobil Chemical Co. - Chemical Coating | Ford Motor Co. Edison Assy. Plant | 3,600 | 0.3 | 3.0 |
| Tenneco Chemical Inc. (Edison) | Ford Motor Co. Edison Assy. Plant | 9,000 | 0.2 | 0.2 |
| Ford Motor Co. Edison Assy. Plant | Stauffer Chemical Co. | 12,700 | 0.6 | 3.8 |
| Stauffer Chemical Co. | Tenneco Chemicals Heyden Div. (Fords Plant) | 2,100 | 0.7 | 4.5 |
| Tenneco Chemicals Heyden Div. (Fords Plant) | Indiana Gen. Elect. Div. | 2,100 | 0.8 | 5.3 |
| Indiana Gen. Elect. Div. | Linde Div. Union Carbide | 4,200 | 0.2 | 5.5 |
| Linde Div. Union Carbide | Middlesex County Utilities Authority | 6,100 | 0.1 | 5.6 |

TABLE 3-6. NORTHEAST BRANCH

| Upstream Industry to | Downstream Industry | Distance Between Industries (ft.) | Industrial Use (mgd) | Accumulated Use (mgd) |
|---|---|---|---|---|
| Intercon Co. | Westvaco Min. Pro. Div. FMC | 2,100 | 0.1 | 0.1 |
| Westvaco Min. Pro. Div. FMC | Metropak Containers | 1,100 | 0.3 | 0.4 |
| Metropak Containers | Gatx Terminals Div. | 1,000 | 0.3 | 0.7 |
| Gatx Terminals Div. | Reichold Chemical Co. | 1,000 | 0.1 | 0.8 |
| Economics Lab Co. | Engelhard Industries,Inc. | 1,500 | 0.1 | 0.1 |
| Engelhard Industries,Inc. | Reichold Chemical Co. | 2,100 | 0.1 | 0.2 |
| Reynolds Metals | Reichold Chemical Co. | 2,100 | 0.8 | 0.8 |
| Reichold Chemical Co. | U.S. Metal Refining Co. | 2,600 | 0.3 | 2.1 |
| U.S. Metal Refining Co. | PSE&G Co. | 11,000 | 1.6 | 3.7 |
| PSE&G Co. | C&P Chemicals Inc. | 5,900 | 1.1 | 4.8 |
| C&P Chemicals Inc. | Chevron USA Inc. | 4,200 | 0.4 | 5.2 |
| Chevron USA Inc. | Hatco Chemical | 14,800 | 3.3 | 8.5 |
| Hatco Chemcial | Indiana Gen. Electronic Div. | 2,100 | 0.2 | 8.7 |
| Indiana Gen. Electronic Div. | Linde Div. Union Carbide | 4,200 | 0.2 | 8.9 |
| Linde Div. Union Carbide | Middlesex County Utilities Authority | 6,100 | 0.1 | 9.0 |

## ADVANCED WASTEWATER TREATMENT SYSTEMS

### General

MCUA presently has a secondary wastewater treatment plant which discharges effluent to the Raritan Bay. The quality of MCUA's effluent is such that only a few industries within MCUA's service area could use it for water reuse without further treatment. This chapter will compare the removal efficiencies of several advanced wastewater treatment systems to that of a secondary activated sludge plant. In addition water quality requirements for various water uses will be evaluated.

Before an industry will commit to purchase treated wastewater they must be assured of its quality and cost. The quality of water that could be supplied to industries will be discussed in this section while the cost of supplying water of various qualities will be discussed in Chapter 5.

MCUA effluent is a very reliable source of water since it has been estimated for this distribution system that only about 30 percent or 24 mgd of MCUA's average flow of 80 mgd would be reused. Thus even at low wastewater flows there is sufficient wastewater available at MCUA to be treated to meet the demands of water reuse customers at all times.

### Water Quality

As shown in Table 3-1 there are a significant number of water users within MCUA's service area and each of these industries has specific water requirements. In order to meet the needs of the most industries it is important to review the treatment requirements for primary water use. Table 4-1 lists some primary water uses and the required treatment level to meet the water quality needs of each water use. MCUA's service area is very industrial and as can be seen from Table 4-1 these industries tend to require that MCUA effluent receive advanced treatment. However, one of the largest existing uses of wastewater reuse is for power plant and industrial cooling.

A survey of all industries within MCUA's service area would indicate which companies are interested in wastewater reuse and what quality of water they would require. The water quality requirements of the interested industries can then be compared to MCUA's secondary effluent as it is or with various advanced treatment processes. An example of several advanced wastewater treatment processes removal efficiencies is shown in Table 4-2. The removal efficiencies for those advanced treatment processes shown in Table 4-2 are for removing that portion of a constituent left after the activated sludge process. Based on the general water quality requirements of the distribution system the appropriate advanced wastewater treatment process, if any is necessary, can be selected.

### TABLE 4-1. TREATMENT REQUIRED FOR PRIMARY WATER USE(1)

| Primary Water Use | Required Treatment |
|---|---|
| Agricultural Irrigation | |
| Forage Crops | Secondary |
| Truck Crops | Secondary |
| Urban Irrigation-Landscape | Filtration |
| Livestock and Wildlife Watering | Secondary |
| Power Plant and Industrial Cooling | |
| Once-through | Secondary |
| Recirculation | Tertiary Lime |
| Industrial Water Supply | |
| Petroleum and Coal Products | Filtration |
| Primary Metals | Secondary |
| Paper and Allied Products | Carbon Adsorption/Tertiary Lime |
| Chemicals and Allied Products | Carbon Adsorption/Tertiary Lime |
| Food and Kindred Products | Carbon Adsorption/Tertiary Lime |

---

1. Information from Water Reuse by E. Joe Middlebrooks, Ann Arbor Science, 1982.

TABLE 4-2. COMPARISON OF AVERAGE PROCESS CONTAMINANT REMOVALS (%)(1)

| Constituent | Activated Sludge | Filtration Process | Lime Treatment | Activated Carbon Adsorption |
|---|---|---|---|---|
| BOD | 89 | 39 | 53 | 53 |
| COD | 72 | 34 | 52 | 47 |
| TSS | 81 | 73 | 65 | 64 |
| $NH_3$-N | 63 | 33 | 22 | 39 |
| $NO_3$-N | + | 56 | - | 55 |
| Phosphorus | 45 | 57 | 91 | 88 |
| Alkalinity | 38 | 83 | x | + |
| Oil and Grease | 82 | - | 40 | 47 |
| Arsenic | 28 | 67 | 6 | 0 |
| Barium | 31 | + | 61 | x |
| Cadmium | 54 | 32 | 30 | 0 |
| Chromium | 74 | 53 | 56 | 48 |
| Copper | 76 | + | 55 | 49 |
| Fluoride | x | - | 50 | 13 |
| Iron | 72 | 56 | 87 | 73 |
| Lead | 69 | 16 | 44 | 32 |
| Manganese | 33 | 80 | 93 | 32 |
| Mercury | 13 | 33 | 0 | 0 |
| Selenium | 7 | 90 | 0 | 0 |
| Silver | 79 | - | 49 | 27 |
| Zinc | 49 | + | 78 | 66 |
| Color | 48 | 31 | 46 | 70 |
| Foaming Agents | 71 | - | 39 | 64 |
| Turbidity | 86 | 71 | 67 | 73 |
| TOC | 83 | 33 | 73 | 64 |

1. Information from Water Reuse by E. Joe Middlebrooks, Ann Arbor Science, 1982.

Symbols: x = data inconclusive; 0 = no significant removal;
+ = increase; - = no data

## COST EFFECTIVENESS EVALUATION

### General

This chapter presents a comparison of capital costs, annual costs and rates for each treatment process. The results of these comparisons to present water treatment rates will indicate which branches of the proposed distribution system and which treatment processes are cost effective. This information can then be refined with information obtained in a survey of industries.

### Capital Costs

Using the flows presented in Tables 3-3 through 3-6 pipe sizes were calculated for each section of each distribution system branch. Construction cost for installed pipe was also calculated. Additional costs relating to pipe installation such as air relief valves, shut-off valves, valve chambers, sheeting, dewatering, restoration, rail road crossings, stream crossings and highway crossings were also added to the distribution system construction costs.

Construction of a pump station and reuse treatment process, if any, are the two other major construction costs related to a water reuse system. The pump station construction cost is based on the maximum flow to be pumped and maximum total head of the system while the reuse treatment process construction cost is based only on the maximum flow to be treated.

The total construction cost of the reuse system has been increased by 30 percent for contingencies and 10 percent for engineering to obtain a total capital cost. Capital costs for each treatment process considered are presented in Tables 5-1 through 5-5 and vary from $51.6 million for the entire secondary treatment distribution system to $77.5 million for the entire carbon adsorption/lime treatment distribution system.

## Annual Costs

MCUA's annual budget will increase between $5.4 million for a secondary treatment water reuse system and $13.6 million for a carbon adsorption/line treatment reuse system. These increases in the annual budget are the annual costs shown in Tables 5-1 through 5-5. Each annual cost can be broken into two parts. The first part is operation and maintenance costs which are primarily due to the new pump station and reuse treatment process while the second part is the debt service charges.

## Comparison of Water Reuse Rates

The primary point of comparison between treatment processes is the rate which a customer would be charged per 1,000 gallons of wastewater used from one treatment process versus another treatment process. However, all of the rates shown in Tables 5-1 through 5-5 are compared to the $1.37/1,000 gal. water rate charged by Elizabethtown Water Company to determine if it is less expensive to buy potable water from a water company. The water quality required by the industries will determine which treatment process will be selected and ultimately which rates will be charged the customers.

As can be seen in Table 5-1 the Southwest Branch of the

### TABLE 5-1. COST OF SECONDARY TREATMENT WATER REUSE(1)

| Distribution | Flow (mgd) | Cost<br>Capital ($ million) | Annual ($million/yr) | Rate ($/1,000 gal) |
|---|---|---|---|---|
| South Branch | 8.6 | 14.2 | 1.5 | 0.49 |
| Southwest Branch(2) | 1.3 | 8.5 | 0.9 | 1.91(3) |
| S and SW Branches | 9.9 | 21.5 | 2.3 | 0.63 |
| Northwest Branch | 5.6 | 14.5 | 1.5 | 0.75 |
| Northeast Branch | 9.0 | 16.9 | 1.8 | 0.55 |
| NW and NE Branches | 14.3 | 29.6 | 3.1 | 0.60 |
| S, NW and NE Branches | 22.9 | 43.8 | 4.6 | 0.55 |
| Entire System | 24.2 | 51.6 | 5.4 | 0.59 |

1. No further treatment before distriubtion.
2. Due to high water reuse rate this branch will not be considered alone in subsequent tables.
3. Exceeds present Elizabethtown Water Co. rate of $1.37/1,000 gal.

## TABLE 5-2. COST OF DUAL MEDIA FILTRATION WATER REUSE

| Distribution | Flow (mgd) | Cost<br>Capital ($ million) | <br>Annual ($million/yr) | <br>Rate ($/1,000 gal) |
|---|---|---|---|---|
| South Branch | 8.6 | 16.9 | 2.0 | 0.64 |
| S and SW Branches | 9.9 | 24.4 | 2.8 | 0.77 |
| Northwest Branch | 5.6 | 16.6 | 1.9 | 0.93 |
| Northeast Branch | 9.0 | 19.6 | 2.3 | 0.69 |
| NW and NE Branches | 14.3 | 33.5 | 3.8 | 0.73 |
| S, NW and NE Branches | 22.9 | 49.1 | 5.5 | 0.66 |
| Entire System | 24.2 | 57.1 | 6.4 | 0.72 |

TABLE 5-3. COST OF CARBON ADSORPTION TREATMENT WATER REUSE

| Distribution | Flow (mgd) | Cost<br>Capital ($ million) | <br>Annual ($ million/yr) | <br>Rate ($/1,000 gal) |
|---|---|---|---|---|
| South Branch | 8.6 | 18.6 | 3.0 | 0.96 |
| S and SW Branches | 9.9 | 26.0 | 3.9 | 1.07 |
| Northwest Branch | 5.6 | 17.9 | 2.7 | 1.33 |
| Northeast Branch | 9.0 | 21.2 | 3.3 | 1.00 |
| NE and NW Branches | 14.3 | 35.4 | 5.1 | 0.99 |
| S, NW and NE Branches | 22.9 | 51.8 | 7.5 | 0.90 |
| Entire System | 24.2 | 59.8 | 8.4 | 0.95 |

TABLE 5-4. COST OF LIME TREATMENT WATER REUSE

| Distribution | Flow (mgd) | Cost | | |
|---|---|---|---|---|
| | | Capital ($ million) | Annual ($ million/yr) | Rate ($/1,000 gal) |
| South Branch | 8.6 | 23.5 | 3.7 | 1.17 |
| S and SW Branches | 9.9 | 31.3 | 4.6 | 1.28 |
| Northwest Branch | 5.6 | 21.8 | 3.2 | 1.54(1) |
| Northeast Branch | 9.0 | 26.1 | 3.9 | 1.20 |
| NW and NE Branches | 14.3 | 41.8 | 6.4 | 1.23 |
| S, NW and NE Branches | 22.9 | 60.3 | 9.5 | 1.14 |
| Entire System | 24.2 | 69.2 | 10.6 | 1.20 |

1. Exceeds present Elizabethtown Water Co. Rate of $1.37/1,000 gal.

### TABLE 5-5. COST OF CARBON ABSORPTION/LIME TREATMENT WATER REUSE

| | | Cost | | |
|---|---|---|---|---|
| Distribution | Flow (mgd) | Capital ($ million) | Annual ($ million/yr) | Rate ($/1,000 gal)(1) |
| South Branch(2) | 8.6 | 27.8 | 5.2 | 1.65 |
| S and SW Branches | 9.9 | 35.9 | 6.2 | 1.72 |
| Northwest Branch | 5.6 | 25.3 | 4.3 | 2.12 |
| Northeast Branch | 9.0 | 30.4 | 5.4 | 1.66 |
| NW and NE Branches | 14.3 | 47.5 | 8.3 | 1.59 |
| S, NW and NE Branches | 22.9 | 68.3 | 12.4 | 1.48 |
| Entire System | 24.2 | 77.5 | 13.6 | 1.54 |

1. All the reuse rates exceed Elizabethtown Water Co. rate of $1.37/1,000 gal.
2. With CA/LT the quantity of water which could be used by industries was increased resulting in slightly low rates as shown in this example:

| | | | | |
|---|---|---|---|---|
| South Branch | 10.5 | 34.4 | 6.1 | 1.60 |

distribution system is not economically feasible by itself even without advanced wastewater treatment. Based on this fact, this branch has been eliminated from consideration by itself in subsequent tables. Table 5-4 shows the situation where the lime treatment process increases the rate for the Northwest Branch of the distribution system to an uneconomical level. The carbon adsorption/lime treatment water reuse table (Table 5-5) indicates that it is not economical to provide extremely high quality water.

A ranking of the water reuse systems by rates based on construction of the entire distribution system and treatment process is as follows:

1. Secondary Treatment - $0.59/1,000 gal.
2. Dual Media Filtration - $0.72/1,000 gal.
3. Carbon Adsorption - $0.95/1,000 gal.
4. Lime Treatment - $1.20/1,000 gal.
5. Carbon Adsorption/Lime Treatment - $1.54/1,000 gal.

As previously mentioned the selected water reuse system will be dependent on the quality of water required by interested industries.

An industry which has a water usage rate of 0.5 mgd and requires only dual media filtration of MCUA's secondary effluent, to meet its water quality requirements, will save approximately $0.60/1,000 gal. or $300/day, if they purchased water from MCUA. Based on Figure 5-1 it can be seen that even an industry which uses 0.1 mgd and requires high quality water may save $100

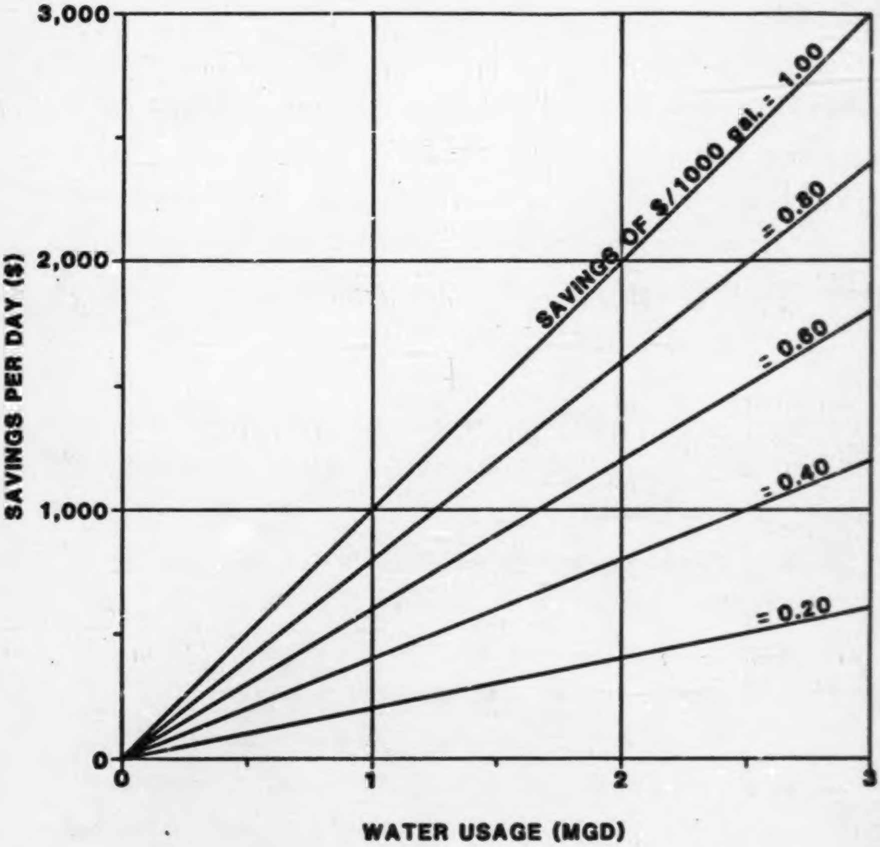


FIGURE 5-1

SAVINGS WITH WATER REUSE SYSTEM

per day or $36,500 per year which in several years would pay for any capital costs that the industry incurred when modifying their own in-house water distribution system and/or additional treatment process.